

Thesis for the Degree of M. D.

The Pathology and Treatment of Contractures.

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The object of the following Thesis, is to consider the conditions that determine the development of the degenerative changes in the muscular systems of patients suffering from chronic diseases, and some contribution to our knowledge of the pathology underlying such changes and the most suitable means for their prevention.

In the numerous text books and monographs that have been consulted, considerable space is devoted to the primary pathological changes that may be said to constitute the disease in these patients; but scarcely any reference has been found to those secondary changes with which this Thesis is mainly concerned.

In many of the conditions which will come under discussion, these secondary changes play a much greater part in the invalidity of the patient, than the primary disease, for it shall be found that patients who have recovered from their original disease are left permanently crippled, or even completely helpless, owing to the secondary changes that have developed at a distance from the original focus of disease.

In some diseases, the importance of being on the lookout for these secondary changes, and taking steps to limit their effects, has been generally recognised, but in others, the importance of directing treatment at an

early stage of the disease towards the prevention of contractures, if known is not generally appreciated. The observations on which this paper is based have been made over the course of a year, in an Institution to which a large number of patients suffering from acute and chronic diseases are admitted. Many of the patients thus admitted have been treated for intervals varying from a few days to many years in other Institutions prior to their admission, and it has thus been possible to observe the effects of the various lines of treatment that have been adopted, and in only too many cases the results of leaving these patients without any treatment at all as regards the conditions under discussion. In a very large number of the cases that have been collected the degenerative changes that have taken place in muscle and nerve have resulted in deforming contractures of the limbs, and it is first necessary to consider how far such contractures are a part of the disease from which the patient is suffering, or has suffered, and how far they result from mere disuse of the limb or prolonged retention of the limb in an unsatisfactory or abnormal position.

At first sight some cases have been met with that appear to have become the victims of contracture merely as the result of disuse or prolonged rest in a faulty position of the limb; but on further investigation there has been found in every case

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some other under-lying condition ~~in~~ which the contracture is secondary. Instances will be given hereafter in which this deceptive appearance was found.

An examination of the cases described in detail in the appendix will show that there is no single case of a contracture existing in a patient in whom there is no evidence of some other disease.

Apparent exceptions to this rule may be found in the well known class of cases described as "hysterical contractures" but in the majority of these the condition with which we are dealing is more of the nature of a spasm than of a contracture, as is evidenced by the disappearance of the condition when the patient is anaesthetised and the absence of those secondary changes with which this paper is concerned.

Another class of apparent exceptions (case No. 78. G.R.B.) are those imbeciles in which deformities have occurred; but the grossness of the changes that have taken place in their mental functions is at least presumptive evidence of gross changes in the central nervous system, and such changes indeed are almost always found at autopsy on these patients.

Cases (No. 1. W.G. No. 2. A.C. No. 3. M.C.W.) are all patients who for some cause or another have been absolutely in bed for prolonged periods, in one case (No. 3) amounting to 27 years. In such cases wasting of an extreme degree may be met with, but

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no contracture makes its appearance, and as in the case of No. 1. W.G, if steps are taken to get these patients about, the wasted limbs resume their function and regain their power with a striking rapidity.

This absence of contracture after prolonged rest in bed is found in patients who are actually suffering from gross disease of the nervous system, and perhaps in some diseases in which the muscular system is primarily affected. Pre-~~iminent~~minent amongst such condition is Tabes Dorsalis. A very large number of these cases have been investigated, and in no case was there found a contracture due to secondary changes in the muscles of the limbs. It is true that deformity often occurs; rarely with limitation of movement of a joint (cases No. 21. M.E.P. 23. A.H.) but such deformities in this disease are always associated with the presence of "Charcots" joints. It may be suggested that this freedom from contractures that is enjoyed by the victims of this disease is owing to the fact that the brunt of the pathological process is borne, if not entirely, at any rate in great part, by the sensory portion of the nervous system.

Among the cases in which contractures occur, those in which the primary seat of the disease is in the muscle itself have received most attention as regards the resulting contracture. In this class may be placed Volkmann's Ischaemic Contracture, and that variety of torticollis which is really an ischaemic contracture as in Volkmann's, being due to the partial cutting off of the blood supply of the Sterno-mastoid branch of the superior thyroid artery (Tubby, Deformities including Diseases of the Bones and Joints, Volume 1- page 57)

Some of the cases detailed in the appendix suggest that this class includes a larger number of cases than is usually supposed. Case No. 25. W.G.H, is that of a man who was compelled to take to his bed because of an arthritis of both knees which had been diagnosed as gout. Early in his disease there was a considerable effusion into each knee joint, which resulted in flexion of the knees and a tendency to backward displacement of the tibia. To counteract this the patient was treated by prolonged extension applied by means of a stirrup formed of lead plaster and weight and pulley over the bottom of the bed. When examined this patient had no effusion in either joint, the knees were so stiff that they appeared to be absolutely ankylosed, the muscles of the leg and thigh were so hard that they could not be dented by

the finger, and skiagrams showed that there was no disease in the joint other than a very slight degree of osteoarthritis. It cannot be doubted that the disability in this man is due, either to a Volkmann's Ischaemic Contracture or to some allied condition associated with the defective circulation in his limbs during the period in which he was treated by continuous extension.

Many cases have been observed in which milder forms of this condition have been produced in patients, who for one reason or another have had prolonged extension applied to one of their limbs. Several cases have been noted (cases No. 26. S.H. No. 28. J.E.) in which elderly people who have sustained an injury to the upper end of their femurs, and have been treated in Hodgen or other suspension splints have suffered, when they were able to get about, not so much from pain or weakness at the seat of injury, as from stiffness of the knee and muscles of the thigh and leg on the affected side; and it is almost invariable for these patients to develop an oedema of the affected limb as soon as they get about owing to the prolonged interference with the circulation caused by the strapping of which the stirrup was composed. No cases treated by Hey Grove's method of transfixion have been under observation; but it may be confidently

predicted that extension applied by such a method will be free from the unpleasant effect above described. In this category may also be placed certain cases that have been under observation in which contractures mostly of a mild degree were associated with chronic inflammatory condition of the superficial structures of the limb.

(Cases No. 29. S.B. No. 30. A.B. No. 31. A.F. No. 32. J.P.) Included among these are a number of cases in which the contracture clearly seems to be due to degenerative changes in the muscle secondary to the inflammation of the neighbouring structures, and it is suggested that these changes may be of the same class as those that occur in typical ischaemic cases. In such cases the contracture always occurs below the lesion and the illustrative cases given are those of chronic ulceration of the leg associated with a contracture of the muscles controlling the ankle joint.

In two of the cases of this class a different process appears to have been at work (Cases No. 34. E.H.

No. 35. M.P.) In each of these cases ulceration of the leg is associated with some contraction of the muscles controlling the knee, and it is suggested that the contracture in these cases is due to a circulatory disturbance in the affected muscles caused by a thrombosis of the veins above the original lesion.

In support of this suggested pathology attention is drawn to case No. 33, S.E.S. This was a patient

who had to be put to bed because of extensive thrombosis of the veins of both legs occurring after **pneumonia**. On her admission 5 weeks later she was found to have a contracture of the muscles of the calf on each side causing an extreme condition of bilateral drop foot.

The occurrence of contractures in patients suffering from peripheral neuritis is well known, and considerable attention has been paid to the prevention of contractures in these cases (Allbutt & Rolleston, System of Medicine, volume 7, page 460. Medical Annual 1916, page 390 and page 118. Dictionary of treatment Whitla page 666. Tubby, Deformities etc, volume two page 772;) but it is perhaps not generally known how rapidly these contractures may occur, and how much longer it may be necessary to have the patient under observation and treatment for the resulting contractures than from the primary disease. Cases No. 38. A.M, No. 40. R.H.P. No. 41, J.F. No. 42. S.P, are illustrative of this. In many cases (No. 36. M.A.H. No. 37. T.H.W. No. 39. L.A.) treatment directed to the prevention of contracture was undertaken within a few days of the onset of the disease, and in such cases the results are almost always uniformly good, although an almost unlimited degree of patience and perseverance is required if good results are to be obtained; but in those cases which come under treatment after varying

degrees of deformity have been allowed to occur, plastic operations, frequent manipulations, and in some cases even amputation is necessary before the patient can be enabled to get about, and the prognosis in nearly all such cases is decidedly bad.

When we come to deal with those contractures that result from spastic paralysis of the limbs, the prevention of contractures, even if under-taken early in the disease is a much more difficult affair. (Cases No. 47. N.R. No. 46. E.M.D.) In this class of case deforming contractures only occur slowly and gradually as contrasted with the rapid and severe deformities that occur in the neglected cases of the former classes. In these cases the contractures result from the prolonged and powerful pull of unbalanced muscles, and the attempts to prevent contracture by ordinary methods only too often result in dismal failure. If, for example, an attempt to keep spastic legs straight by means of an extension, applied by a stirrup and weight is made, the weight that is necessary is so great that strapping sores and ischaemic contracture are almost inevitable; or if again the limbs are placed in plaster the spasm of the muscles is so strong that even the greatest care will not prevent pressure sores, and even a thick plaster may be bent and broken and so

necessitate its removal. It is for this condition that division of the posterior nerve roots of the region affected has been suggested (Medical Annual, 1914; but the mortality of this procedure is high and the results are not uniformly successful.

In some of the cases of this class under observation an attempt was made to over-come the spasm by injection of rectified spirit (alcohol 90%) into the main nerve trunks of the limb (Case No. 47. N.R.)

This case was a man suffering from Disseminated Sclerosis, with severe spastic paralysis of his legs. Attempts made by several different methods to keep the legs straight failed.. Both sciatic nerves and both obturator nerves were dissected out and alcohol injected into the nerve trunks. The improvement that was thus produced was however, only temporary, and further investigation is needed before the value of this method of treatment can be decided.

The contractures which occur in patients suffering from Hemiplegia resulting from an intracranial lesion, like those mentioned in the preceding class are slow in their onset; but unlike them they are easy to prevent because the pull of the spastic muscles is never so strong as to render unsuitable simple methods of treatment.

It is by no means uncommon to see cases in which recovery from the initial lesion has been almost complete, but in which the fore-arm and hand have become so contracted by secondary changes as to leave them almost useless, while plastic operations have to be under-taken to correct the drop foot that has been allowed to occur.

It is perhaps in this class of case that the results of neglect of early treatment are so often seen. This is probably in a large measure due to the fact that at the onset of the disease the recovery of the patient is so often in doubt for a long time, so that by the time that the patient's recovery is certain the contracture has already to some degree occurred. It will be pointed out when preventative treatment is being discussed how important it is to start treatment directed to the prevention of contractures, within a few hours or at the most a day or two, of the onset of the paralysis.

Next must be considered a class of cases which is probably allied to those in the last two classes, but which are separated from them clinically by their very gradual onset and the almost invariable symmetry of their distribution.

These are the cases in which the contractures occur in patients suffering from Paralysis Agitans and from that group of affections that have been described as Senile Paraplegia (Allbutt & Rollston System of Medicine, vol. 7, page 805)

The cases of this latter disease are peculiarly liable to give rise to the impression that a patient has become contracted merely from lying in bed, the nonoccurrence of which has already been pointed out. Case 67. J.S, is an instance of this, and it is to be noted how often this condition of senile rigidity is over-looked, generally being masked by the extreme infirmity of the patient, for as far as the cases under observation go this condition only occurs in those who are suffering from a severe degree of those diseases commonly associated with old age.

Finally there is the class of patients in whom contractures occur while they are suffering from diseases of joints. In this connection a broad and definite distinction can be drawn between those in whom a deformity results from a disorganization of the joints and absorption of

bony surfaces and in those in which deformity results because of a true contracture of the muscles associated with chronic joint disease in which any deformity of the bones is only or mainly secondary to the changes which have taken place in the muscles (Cases No. 71. J.T.P, No. 72. L.H. No. 73. A.P. No. 74. E.B. No. 75. S.K. No. 76. E.G. No. 77. J.T. No. 79. M.B.)

With the former of these this Thesis is not concerned but a consideration of the latter cases will be necessary as they differ from the cases that are being considered only by reason of the greater difficulty that is found in treating them, owing to the well known progressive character of the primary lesion.

In these cases too, the best treatment for the threatened contractures is absolutely contraindicated as being the worst possible treatment for the under-lying joint condition.

It will be seen that the above classes embrace diseases differing very widely in their causation, symptomatology, and essential pathology; but they are brought together here because in all of them one of the features of the disease is the formation of, or tendency to the formation of contractures.

Now it has been shown that if for any reason a muscle is subjected to prolonged disuse, that muscle will undergo an atrophy, e.g. If a part is not functionally active a general atrophy, involving not only the muscle, but all the structures supervenes. In the experiments of Bum both hind legs of a dog were immobilized and an arthritis set up in one of the joints of one leg. Pieces of muscle excised after six to eight days fixation showed degenerative processes equally marked in both limbs. The fixation then causes the atrophy, the inflamed joint being only an element of auto-fixation. Experiments on animals then, are in favour of the theory of simple atrophy rather than from a tropho-neurosis.

Further, two facts are against the tropho-neurotic theory; first, the very early onset of the muscular degeneration; second, that while the amount of atrophy seems to bear no relation to the severity of the arthritic disease, it does seem to be quantitatively related to the degree of immobilization present. Still the reflex or atrophic theory is supported by such great names as Vulpian, Paget and Charcot, and it has many points in its favour.

(Tubby. Deformities and injuries of bones and joints.

The same may be said of those cases in which "functional" contractures are said to occur. Here there may be the most extreme atrophy, but as is well illustrated by cases No. 1. W.G. No. 2. A.C. and No. 3. M.C.W, unless there is some gross organic lesion no true contractures occur and a resumption of function on the part of the muscles in question rapidly and easily restores them to their normal condition.

Also in the hysterical type of contracture there is atrophy from disuse and the termination is almost always in recovery which in many cases takes place abruptly (Fagge and Pye-Smith, page 806.) ^(Principles & Practice of Medicine)

The pathology of those contractures which are described under the head of Volkmann's Ischaemic Contracture is very well understood. This contraction occurs in the fore-arm and hand ^{and} it rapidly follows on bandages applied too tightly and Volkmann thought it due to an Ischaemic origin, dependant on the arrest of arterial blood supply and therefore of oxygen to the muscles. As a result the contractile substance coagulates and breaks down, and in effect a state of rigor mortis or necrobiosis is established. The accompanying venous stasis, due to constriction or pressure causes exudation into or between the muscles, hastens the onset of paralysis and in severe cases renders them intractable to any form of treatment. Volkmann pointed out that the paralysis and contracture come on almost simultaneously or nearly so, whereas if the contracture is due to nerve injuries alone it comes on gradually and some time after the injury.

There is great rigidity at first which increases

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later owing to the formation of scar tissue forming. The deprivation of the blood supply is only partial otherwise gangrene would set in; but the severity of the contracture is directly dependant upon the degree of deprivation of the arterial blood and the prognosis varies with the amount of muscular tissue affected.

Adami depicts the wax like degeneration of muscle which follows on temporary ligature of the main artery. It comes on very rapidly and in the example figured by him the muscular changes were observed in fourteen hours. Therefore, any lesion which interferes with blood supply to the limb initiates those morbid changes which result in contracture, and they are intensified when the freedom of the return venous flow is checked. (Tubby's Deformities including diseases of the bones and joints, Vol. 1, page 742.)

In the muscles, if abnormal pressure has existed for more than three to six hours, the contractile tissue undergoes rigor mortis, and necrobiotic changes set in, with rapid degeneration and shortening. While the pressure on the larger vessels is going on, and more particularly when it is removed, marked effusion takes place and round - celled infiltration commences, of the soft tissues. The muscle is more or less replaced ultimately by connective tissue, and, as time goes on, the cicatrix becomes harder and shorter.

The microscopical changes, are gradual disappearance of muscle nuclei and muscle fibres, increase of interstitial connective tissue, and replacement of the fibres by the same substance. (Tubby. Deformities including diseases of the bones and joints. Vol. 1, page 745.

Robert Jones (Injuries to joints, page 49) considers that Volkmann's Ischaemic Contracture is a species of coagulation necrosis allied to rigor mortis because it is marked by paralysis and contracture of the muscles of the fore-arm which usually comes on suddenly, and the contracture is part of the initial process, and is due to partial ~~coagulation~~ of the proteids of the muscles caused by lack of oxygen and blood supply. The microscope shows a considerable fibrosis. It is therefore a fibrous myositis which does not confine itself to any particular nerve track, but generally affects all equally. The circulation is badly affected and the nutrition shows serious damage. The paralysis is rarely complete.

Congenital Torticollis is apparently an Ischaemic contracture as in Volkmann's due to partial cutting off the blood supply of the Sterno-Mastoid branch of the Superior Thyroid artery, which artery supplies the middle and lower third of the Sterno-Mastoid muscle. In this artery there is little anastomosis and the circulation of blood in this small artery is easily obstructed in certain positions of the head. Therefore lateral flexion of the head with elongation of the neck and particularly lateral flexion with torsion of the neck obstructs readily. The pathology shows the same changes as in Volkmann's Ischaemic Contracture for there is degeneration of muscle and increase of fibrous tissue. (Tubby. Deformities including injuries of bones and joints, Vol. 1, page 57.)

Only one case of Volkmann's Ischaemic Contracture

(Case No. 24. G.A.B.) has been under observation.

It is suggested that cases No. 25 to 34 have practically the same pathology as is present in Volkmann's Ischaemic Contracture. Clinically the condition of the muscles is the same. In all these cases the muscles are extremely hard and cannot be dented with the finger. The joints are stiff and certain muscles are contracted. In cases No. 25, W.G.H. No. 26. S.H. No. 28. J.E, the prolonged pressure caused by the extension with lead plaster no doubt interfered with the arterial blood supply, and the fact that the limb in each case was more or less immobilised, would ensure a certain amount of venous stasis. Therefore there are present the two essential conditions necessary for the production of a condition allied to Volkmann's Ischaemic Contracture. In case No.27, S.M, the plaster applied was very tight, and here again there is the pressure interfering with the arterial supply, and the immobilisation of the limb. Cases No.29, S.H. No. 30. A.B, No. 31. A.D, No. 34. E.H, and No. 35, M.P, in each one of which ulceration of a chronic variety had been present. When there is chronic ulceration in a limb, there is swelling with induration in the region of the ulcer. Therefore in these cases, the two essential conditions necessary to promote contractures allied to Volkmann's Ischaemic Contracture are present. There is always venous stasis in cases of chronic inflammation, with the formation of scar tissue derived from the connective tissue cells. The pressure caused by venous stasis and the contracture of the newly formed fibrous tissue will cause a gradual diminution in the arterial supply and in a short time there is developed a typical Volkmann's Ischaemic Contracture.

Case No. 32, J.P. This contracture is the result of an old injury which was not properly treated. Probably he had inflammation for some time, so the same condition would develop as in the last cases mentioned. The sections obtained from the Gastrocnemius on the affected side, show many muscle fibres atrophied, a thickening of the outer two coats of the arteries, and the nuclei in connection with the Sarcolemma show proliferation. Unfortunately it was only possible to obtain sections of muscles from one case of this class (No. 32, J.P) and that case by no means a typical one. The only thing to be noted in this section is the thickening of the arterial walls and the proliferation of the nuclei in connection with the Sarcolemma. This condition of the muscles is seen in sections obtained from cases of Hemiplegic contractures, where the proliferation of the nuclei appears to occur as an initial stage to the fibrosis of the muscle.

In case No. 33, E.S, where there are comparatively rapid contractures of the calf muscles following thrombosis, in the vein in the lower third of the leg there is a condition of venous stasis followed by induration and the formation of scar tissue. The oedema and the formation of scar tissue would cause pressure on the arteries, and therefore restrict the supply of blood to the part.

In all the cases of this class it is suggested, that the fibrous tissue in the arterial wall is increased, as seen in section of case No. 32, J.P, and is part of the general fibrosis in the vicinity. Therefore a vicious circle is set up when there is venous stasis

proliferation of connective tissue cells, and formation of scar tissue and an increase of fibrous tissue which narrows the lumen of the blood vessels. This gradually decreases the flow of arterial blood to the part, and this again is an essential condition of promoting Volkmann's Ischaemic Contracture. So long as immobilisation only, is present, it has been shown that no contractures occur, but in all the diseases under discussion, there is, in addition to immobilisation, some factor interfering with the efficient circulation of the part. It may be simple mechanical obstruction, as in Volkmann's, due to a tight bandage splint, or as in cases No. 24, G.A.B, No. 25, W.G.H, No. 26, S.H, No. 28, J.E, due to pressure by lead plaster, or from pressure from a plaster applied too tightly, as in cases No. 27, S.M, and it may be from inflammatory exudation, as in cases No. 29, S.B, No. 30, A.B, No. 31, A.F, No. 32, J.P, No. 34, E.H, No. 35, M.P, or it may be due to some vaso-motor disturbance dependant on some lesion of the nervous system, as in cases Nos. 36 to 70.

When the contractures that occur in class 3 are considered it is found that the statements in the literature dealing with the pathology of the muscular contraction vary in proportion as they are vague and unsatisfactory, e.g., Allbutt & Rolleston, ^{System of Medicine} Vol. 7 page 415. The changes in the muscles are described as follows- the muscles are pale and wasted, the fibres are reduced in size but all the fibres are not affected to the same extent. The connective tissue is altered and its over-growth is sometimes so very great that it looks as if there had been a primary fibrosis of muscle with a secondary atrophy of fibres. Two causes are suggested:- that it is secondary to the irritating effects of the poisons on the nerve branches; or that it is primary, and due to the action of the poison on the muscle itself.

Judson S. ~~Bury~~. Diseases of the nervous system, page 159, notes that the muscles in connection with the diseased nerves are pale and wasted and their fibres are reduced in size and that sometimes there is over-growth of the connective tissue of the muscles. This interstitial myositis is chiefly found in cases of chronic neuritis but it may develop in acute cases. Probably in some instances it is due to the direct action of the poison on the muscular tissues, whilst in others it is secondary to the neuritis. Some of the blood vessels in the nerves and muscles may show thickened walls with surrounding exudation.

There appears to be in these selections substantial agreement as to the actual changes that take place and it was noted by Judson S. ~~Bury~~ that the blood

vessels in the muscles show thickened walls with surrounding exudation. It is suggested that these cases in this class are allied to Volkmann's Ischaemic Contracture. There is a venous stasis and diminished arterial supply partly due to the immobilisation of the limb but primarily due to some vaso-motor disturbance dependant on the lesion of the nervous system. When the stasis occurs there is a proliferation of connective tissue cells with the formation of new fibrous tissue in the muscles and in the arterial walls. This will cause diminution in the lumen of the arteries and still further gradually decrease the supply of blood to the part and so there will be a still further increase of fibrous tissue which on undergoing contraction will cause the contractures in this class of case.

It has unfortunately not been possible during the period ~~under~~ⁱⁿ which these observations have been made to obtain sections of the muscles of a case in this class.

It is also suggested that the same changes occur in cases of Anterior Poliomyelitis (acute). Tubby, Deformities including diseases of bones and joints, Vol. 2, page 593, gives the following pathology in the affected muscles. The muscle fibres show granular degeneration and the nuclei of the sheath and of the interstitial tissue increase. In many cases the muscular fibres disappear and are replaced by fibrous tracts developed from the Sarcolemma sheaths and the interstitial connective tissues. Frequently fibres presenting a normal appearance are seen in the midst

of the degeneration area. In slighter cases hypertrophied muscular fibres have been seen forty to forty-five years after the occurrence of the disease, so a partial recovery takes place.

F. R. Fisher on "The contracted muscles of infantile paralysis" says:- the theory usually accepted for the production of talipes is that, owing to unbalanced state of the muscles, the stronger have been in a position of over-action and have over-powered their weaker opponents and by gradually approximating their own points of attachment have been permanently contracted. This is wrong for the contraction of the muscles precedes the drawing together of their points of attachment, the latter being not the cause, but the result of the contraction with which the shortening of the fibres is coincident. It is doubtful if the muscle will acquire from over-action, a condition of contraction. The causes which excite the structural changes which constitute the condition known as "Contracted muscles" are complex. Contracted muscle is a bad term to give to a muscular lesion. Intractile is a better term because contraction is a normal attitude of muscle fibre. Here is an abnormality in the deprivation of the tissue in its inability to relax. Intractile muscle better defines the state of inextensibility which is the main feature of the defect. There is one constant feature which presents itself in all cases of disturbed muscular balance. The stronger muscles always become intractile to some extent but this is the limit of methodical procedure.

In theories on the development of paralytic talipes writers have over-looked the point that muscular intractility is as distinctly a loss of natural function as is muscular paralysis. In the one case ability to relax is reduced, and in the other, power of contraction is lowered. The power to cause relaxation is as much the function of the cells of the Anterior Cornua as is that of contraction.

It is suggested that there is a more simple pathology in the formation of these contractures of Infantile Paralysis. There is a venous stasis and diminished arterial supply in the affected limb due to some vaso-motor disturbance dependant on the lesion of the nervous system. The same process occurs as in cases of Multiple Neuritis; there is a proliferation of connective tissue cells with the formation of fibrous tissue around the muscle fibres and bundles and an increase in the coats of the arteries, which further gradually decreases the amount of arterial blood flowing to the part and thus causing a condition of fibrosis of the muscle such as is seen in Volkmann's Ischaemic Contracture. The reason why, in all these contractures there is flexion instead of extension is that the flexor muscles are more powerful, have a greater blood supply, a greater fibrosis is present, which, on contracting over-comes the resistance of the weaker extensors.

In the next class of cases (Class 4) as regards the pathology of the contractures, the same process occurs as in the hemiplegic type. In Spastic Paraplegia (Cases No. 46. E.M.D, and 47. N.R.) the inhibitory influence from the cerebrum is more completely cut off than in hemiplegia. Thus it is that the contractures are more severe and much more difficult to deal with.

There is spasm of all the muscles of a part, the flexors over-coming the extensors. As will be seen when the hemiplegic type is dealt with this class of case probably has much the same pathology as regards the muscular contractions as occurs in hemiplegia. There is stasis in the veins and diminished blood supply through the arteries with a proliferation of connective tissue cells and a formation of fibrous tissue around the muscle fibres and bundles and in the walls of the arteries owing to some vaso-motor disturbance due to a lesion in the central nervous system. It is another example of a condition allied to Volkmann's Ischaemic Contracture the process of the formation of fibrous tissue with its subsequent contraction being the same in all the classes under discussion.

In the next class of case (Class 5) a post-mortem was obtained on two subjects. They are by far the most numerous type occurring in this Infirmary (Cases 48 and 66) Sections of muscle were obtained from Case No. 49, G. G, and 60, E.S. Some of these sections show clear areas both in the fibres and around them which probably points to oedema which disappeared on cutting.

Thickening of the middle and outer coats of the arteries are present and in two sections a thrombosis in the lumen of the artery ~~was~~ observed. Some sections show swollen fibres, others atrophied fibres. In some of the specimens great proliferation of the nuclei in connection with the Sarcolemma is the prominent feature of the slide, in others there is either increase of the fibrous tissue around the muscle bundles or around the individual fibres. When the fibres are swollen the proliferation of the nuclei in connection with the Sarcolemma is very active, but when the fibres are atrophied the Sarcolemma disappears and there is present massive patches ^{of fibrosis.} It appears to be that when there is increase of fibrosis between individual fibres there is no increase in the proliferation of the nuclei in connection with the Sarcolemma. It looks as if something caused the Sarcolemma to proliferate, which is followed by fibrosis.

Therefore in these cases there is probably stasis, which is noted clinically by oedema in the early stages of a cerebral haemorrhage, with diminution in the arterial supply caused by a vaso-motor disturbance dependant on the lesion of the nervous system, and perhaps partly due to the immobilisation of the limb, due to the paralysis. There is evidently an exudation causing pressure, a proliferation of the connective tissue cells followed by the formation of fibrous tissue around muscle bundles and muscle fibres, an increase of fibrous tissue in the middle and outer coats of the arteries, some thrombosis in the arteries and in some cases perhaps in the veins, due to the diminishing blood flow, and all these conditions being

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present, a condition allied to Volkmann's Ischaemic Contracture follows. The flexors are almost always more contracted than the extensors, but there is fibrosis in both flexors and extensors (Cases No. 58, A.E, and 59, E.H) The flexors are the most powerful, there is probably a greater blood supply, a greater degree of fibrosis, which most likely accounts for the fact that the contractures are flexor. On looking up the literature in connection with hemiplegia, very little reference is found to the contractures which are so universally common. In Allbutt and Rolleston, System of Medicine, Vol. 8, page 293, there is a reference to the rigidity of hemiplegia. They give three kinds:- an initial rigidity occurring at the onset of the lesion and ascribed to irritation. A secondary rigidity coming on after the lapse of weeks or may be of months, and a permanent contracture in which conditions structural changes have taken place in muscles and perhaps in joints, and which is a natural consequence of secondary rigidity. The explanation of rigidity is obscure. Hughlings Jackson considered that the rigidity was the result of unantagonised cerebellar influx, and this was considered to be the most feasible explanation, but it is difficult to understand why it does not take place from the very beginning, when the cerebral influence is cut off.

It is considered that the above theory is disproved when the pathology is shown to be consequent on changes which take place in the same way as those which occur

in Volkmann's Ischaemic Contracture.

If Hughlings Jackson's theory is accepted, Allbutt and Rolleston consider it difficult to understand why the rigidity does not take place from the very beginning, but if the Ischaemic contracture theory is correct then there is no difficulty in appreciating the fact that the rigidity in contractures may take place sooner or later, according to whether the blood supply to the part is more or less affected, for "the severity of the contracture is directly dependant upon the degree of deprivation of the arterial blood. Tubby, Deformities including diseases of the bones and joints* Vol. 1, page 472" therefore if the venous stasis and lessened arterial flow come on very gradually, the contracture and rigidity will be some time in making its appearance, but if the flow of blood undergoes a rapid change, then the condition necessary for a rapid onset are present.

In those cases of Paralysis Agitans and Senile Paraplegia (Class 6) (Case 67. J.S. No. 68. J.L. No. 69, F.R. No. 70. S.G.) the literature does not give much information on the subject of the changes in the muscles. In Paralysis Agitans (Albutt and Rolleston, System of Medicine, Vol. 8, page 473,) the muscles have presented wasting of many fibres with increased longitudinal fission, a diminution in the muscle spindles, and an increase ~~in~~ the nuclei of the Sarcolemma which have been thought to be unduly dark.

In Senile Paraplegia (Albutt and Rolleston, Vol. 7, page 805) three main forms are described, the muscular, the spinal and the cerebral. In these three types the muscles gradually become stiff and they undergo contracture and on palpation, varying degrees of hardness are met with. In the spinal and cerebral forms there is no mention of the pathology of the muscles but the following changes are described in the muscular type:-

"There is hardness and contractures of certain muscles, especially flexors and adductors of the hips and is most marked in the ham string muscles. The whole of each affected muscle is diffusely permeated with fibrous tissue, the muscle fibres are diminished in size, and despite the general emaciation of the patient, there is fatty infiltration of the muscles, giving them a colour paler than normal."

It is suggested that in this class of case the same process occurs in the formation of contractures, as is seen in Volkmann's Ischaemic Contracture and the other classes mentioned in this thesis. Unfortunately it has not been possible to obtain sections of the muscles

post-mortem in any of these cases. In paralysis Agitans it is probable that through some vaso-motor disturbance a stasis occurs in the veins and there is diminished flow of arterial blood to the parts, with the result that there is a formation of fibrous tissue around the muscle bundles and muscle fibres and in the walls of the arteries in the same way as is seen in cases with Hemiplegia as a result of some cerebral lesion. It is noticed in these cases that the more severe the rigidity is, the less tremor is present. In Senile Paraplegia it has been shown that the affected muscles in the muscular type are diffusely permeated with fibrous tissue. Considering the clinical aspects of the three types, they are much the same as regards the rigidity and contractures. Therefore it is probable that the same process occurs in the muscles as in Paralysis Agitans and the other classes already mentioned. There is alteration in the blood supply of the parts affected with the formation of fibrous tissue, and in this class of case (Class 6) a condition is being dealt with which is allied to Volkmann's Ischaemic Contracture.

In Paralysis Agitans and the Spinal and Cerebral types changes are described (Allbutt and Rolleston, System of Medicine, Vol. 8. page 473- Judson S. Bury, Diseases of the nervous system, page 438) in the central nervous system, but there is no mention of any pathology in connection with the muscular type of Senile Paraplegia. It is suggested that there are changes in the central nervous system of the muscular type as well, and it is due to these changes in the central nervous system which

cause the vaso-motor disturbance with the result that there is an altered blood supply to the part with the formation of fibrous tissue resulting in contraction.

In the last class of case to be dealt with (Class 7) contractures develop while they are suffering from diseases of the joints (Cases No. 71-80). In one case of this class (No. 80. A.B.) sections of muscles were obtained post-mortem. In one of the sections (left biceps cruris) the vessels show greatly thickened walls with massive fibrosis around these vessels. Some sections show proliferation of the nuclei in ~~with~~ connection with the Sarcolemma and in others there is fibrous tissue forming around the muscle fibres. Therefore it is found as in some cases of hemiplegia (Cases No. 49. G. G. and No. 60, E.S.) that some muscles show proliferation of the nuclei in connection with the Sarcolemma while others show fibrosis either around the muscle bundles or muscle fibres. It is noted that these sections also show that it is probable that the proliferation of the nuclei in connection with the Sarcolemma is the fore-runner of the fibrosis around the muscle fibres.

The pathology in these cases is fully discussed in Fibrositis. Llewellyn and Jones, pages 89-102, ^{note} that as a result of a "sub-infection" there ensues in the region of the joint in the periarticular tissue a state of hyperaemia and dilatation of the small blood vessels and capillaries and coincidently there is a migration of cells into the interstitial tissues.

There is a proliferation of the nuclei of the connective tissue and if the inflammatory stage be more intense or protracted the nuclei of the connective tissue fibres undergo gradual transformation. These eventually assume the character of wavy interlacing processes, and an over-growth of fibrous tissue occurs.

Therefore in these cases of Periarticular joint disease whatever be the cause of the inflammation, if it becomes chronic there is stasis in the veins, dilatation of the capillaries, a proliferation of connective tissue cells, with the resulting formation of fibrous tissue followed by the formation of contractures. This condition is evidently allied to Volkmann's Ischaemic Contracture and the pathology can be brought into line with the conditions noticed in all the classes of this thesis, except the first. The pathology is almost exactly the same as is seen in cases No. 29. S.B. No. 30. A.B, No. 31. A.F. No. 32. J.P, No. 34. E.H, and No. 35. M.P., a chronic inflammation being the cause of the excessive production of fibrous tissue.

On going through the literature some other points were noted in connection with contractures. e.g. In Thomson and Miles, Vol. 1, page 404, an article on contracture of muscles appears. "Permanent shortening of muscles may result from the prolonged approximation of their points of attachment, or from structural changes in their substances produced either by injury or disease. It is a frequent accompaniment and sometimes a cause of certain deformities, in the treatment of which lengthening of the shortened muscles or their tendons

may be an essential step."

That a permanent shortening of muscles may result from the prolonged approximation of their points of attachment is a view that has been adopted by many writers, but it must be qualified, for the observations made go to show that there is always an underlying pathological condition. The prolonged approximation of the points of attachment of a muscle will not cause permanent shortening, for in cases No. 1, W.G. No. 2. A.C. and No. 3, N.C.W, it has been shown that there is no fibrosis of muscle and no true permanent contracture of muscle.

In cases of congenital Talipes Equino Varus (Thomson and Miles, Vol. 1, page 812 & Rose and Carless, ^(Manuals of Surgery) page 438) it is pointed out that the deformity of the foetus is due to it being easily moulded into abnormal attitudes by external pressure, such as might be exercised by the wall of the uterus when the liquor amnii is deficient. It is also mentioned that these deformities often occur in several members of the same family and is often associated with Harelip and Spina Bifida. It is suggested that there is an under-lying pathological condition which initiates the causation of these deformities. The fact that it may run in families and may be associated with Harelip and Spina Bifida show that probably there is an under-lying condition of the central nervous system causing an alteration in the vaso-motor control and a condition follows whereby there is an alteration in the flow of blood to the part.

In a foetus with a healthy central nervous system, if the foot were in an abnormal position with some external pressure upon it, it is probable that the interference with the blood supply caused by that position, would not result in deformity; but if a foetus has some inherent weakness in the central nervous system and the foot gets into an abnormal position and there is some kind of pressure upon it, then it is probable that if there is not proper vaso-motor control, there will be an alteration in the supply of blood to the part and it is suggested that here again there is a condition allied to Volkmann's Ischaemic Contracture. If there is that altered vaso-motor control there may be stasis in the veins and diminished flow of blood in the arteries, ~~the~~ which with the abnormal position and the pressure, will cause a proliferation of connective tissue cells with the formation of fibrous tissue around the muscle fibres and bundles and in the walls of the arteries with the ~~inevitable~~ result of contraction followed by the deformity described.

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In the first class of cases mentioned; namely, those in which no contractures occur, even though the patient has been in bed for many years (No. 1. W.G, No. 2. A.C. No. 3. M.C.W) the treatment carried out was to gradually get them up every day for very short periods at first, until they were up and about all day, with massage and passive movement. The most gratifying results were obtained in Case No. 1, W.G, who has been discharged from the Infirmary and is now able to earn his living as a labourer. Case No. 2, A.C. and No. 3, M.C.W, are much older in years and it will no doubt take some time to get them accustomed to the changed methods of existence, but already the benefit derived from getting out of bed every day and sitting up in a chair, with the improved circulation from the massage and movement, is clearly apparent in the increased amount of food taken and the more natural action of the bowels.

With reference to "hysterical" contractures, there have been no cases in this Infirmary during the last year, but the treatment recommended (Fagge and Pye-Smith, Text Book of the Principles and Practice of Medicine, Vol. 1, page 915) is as follows:- For the rigid contraction of the limbs, the application of the continuous galvanic current is sometimes useful, But probably benefit more often results from straightening the affected joints under Chloroform and placing the limb upon a splint, than from any other plan of treatment. Sir Thomas Watson speaks of cases in which a stream of cold water directed upon the contracted

part and continued in spite of the patient's complaints of pain, led at once to the relaxation of the spasm. He also mentions an instance in which Sir Charles Clark cured by the same method a girl who had hysterical trismus and could neither speak nor eat. For the contractures, drugs, e.g. Asafoetida are useless. Drugs are only useful for the other effects of hysteria.

The treatment of deformities in imbeciles will not be noted here, as no cases remain long enough in the Institution for any prolonged observation of a line of treatment.

In tabetic cases, the contractures due to the deformity caused by the disorganization of the joint, and the best way of dealing with such a case is to devise a suitable form of apparatus, so that a patient may be enabled to get up and about.

In the next type of case, early treatment for the contracture is strongly recommended, and massage, passive movement and radiant heat (the apparatus made by the Bowsing Co, is very useful) should be vigorously applied to all of them. Some form of splinting should be devised to meet each kind of case, so that the various contractures may be gradually reduced. It is found that charcoal splinting (sheet steel) answers the purpose very well, for it is strong enough to withstand the strain required and is easily bent to any desired angle.

One of the faults is that it is rather heavy and the difficulty has always been in finding some form of apparatus which will stand the necessary strain and yet be of sufficient lightness. In using these splints they should be well padded.

In case No. 24, G.A.B, the flexion of the wrist, elbow and fingers were gradually over-come by means of charcoal splinting. Day by day, first the fingers were gradually extended by straightening the splint by degrees, until they were fully extended, then the wrist was extended in the same way until it was in an over-corrected position. Following on that the elbow was straightened out. During this treatment the boy had massage every day, with active and passive movements, and radiant heat was applied regularly. He improved rapidly under the treatment.

For cases of Volkmann's Ischaemic Contracture, Robert Jones (Injuries to joints, page 49) has discarded operation. He does not lengthen tendons, or shorten bones, but finds the mechanical campaign more effective. The muscles are stretched gradually, joint by joint, beginning at the fingers. A.S. Taylor advises re-section of the radius and ulna sufficient to admit of dorsiflexion of the joints in preference to ~~the~~ division of the shortened muscles.

The excellent results obtained in the above case help to show that by following Jones's method of mechanical treatment, there is no need to advise operation in these conditions.

There have been no cases under observation of torticollis

but the treatment advised (Rose and Carlsson, page 428) is, massage, electricity, manipulations, and some form of mechanical apparatus to correct the deformity. Some cases require tenotomy or myotomy.

Cases ~~W.G.H., No. 25, S.H., No. 27, S.M., and No. 28, J.E.~~, No. 26, S.H., No. 27, S.M., and No. 28, J.E., are patients who were treated for fractures, ⁱⁿ and the resulting local condition of the muscles allied to Volkmann's Ischaemic Contracture the same treatment was followed in each case. Regular massage, radiant heat four times a week, and the patient encouraged to move the limb and get about as much as possible. The results of this treatment in all these cases was very good.

Case No. 25, W.G.H., was treated for some time by means of extension with a stirrup of lead plaster with weight and pulley over the end of the bed, so the condition of his muscles was due to the same cause as the preceding three cases, and the treatment was the same and he is slowly improving.

The following cases, No. 29 to No. 35, are all patients with conditions of much the same type as regards treatment. Except for cases No. 33, E.S., and 35, M.P., they were all put on massage, movement, with radiant heat four times a week.

Cases No. 29. S.B., and 30 A.B., only stayed a short time in the Infirmary, so no results could be noted.

Case No. 31. A.F., has been in the Institution for six months, and the results are very encouraging. First of all attention was paid to the ulcers and when they were healed, the ~~Tendo~~Achillis of the left foot was

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lengthened and the foot placed in a right angle charcoal splint. Three days after the operation the patient was got up and encouraged to use her foot and walk about. She had massage and radiant heat regularly, then she was allowed up all day, but at night the splint was re-applied, but now (August) it is entirely dispensed with and the patient has no further trouble with her leg.

No. 32. J.P, No. 33, E.S, both died before any results could be noted.

Case No. 34, E.H. This patient is now being treated with massage, movement and radiant heat and she is encouraged to move about freely all day and to make efforts to bring her heel to the ground and straighten her knee when walking. There is already some improvement, for the lower third of the leg is not so hard and the ankle is less stiff. It may be necessary to divide her Tendo-Achillis, and also to put the leg on extension by means of a stirrup of lead plaster and weight and pulley over the end of the bed, but the more conservative method is being tried first with the hope that good results will be obtained without having to operate or confine the patient to bed for extension.

Case No. 35, M.P, is too old and feeble for vigorous methods of treatment.

In the next class of case treatment should be commenced at the very onset of the disease, even before any signs of paralysis have manifested themselves. In ~~multiple~~ multiple neuritis the area of paralysis often extends

for some time after the appearance of paralysis. In acute anterior polio-myelitis (Tubby, Vol. 2, page 601) the paralysis is rapidly developed and reached its maximum within a few hours or a day or two after the onset of the attack. Generally the original paralysis is greater than that which persists.

In multiple neuritis (Allbutt and Rolleston, Vol. 7, page 460, System of medicine) when the acute symptoms have subsided, the patient is put on massage, electricity and tonic treatment. No massage is given in the acute stage as it is hurtful and painful, but it is advised that it should not be left too long. At first, gentle massage is ordered for short periods of time, but as soon as the patient stands it well, it ought to be regularly and vigorously applied, and the patient should be encouraged to make voluntary movements against resistance, and other modes of Swedish exercises taught him. Inco-ordination of movement is best treated by Fraenkels method, so that he gets graduated and systematic exercises, and thus the tendency to contractures is overcome, and the patient's capacity for assimilation of food is steadily increased. The constant current aids the restoration of degenerated nerves and muscles and large electrodes are used, so that as much muscular tissue as possible may be reached by the current. A daily warm bath followed by vigorous friction to the skin is of value, whilst tonics and Cod-liver oil often prove of great service. The patient may get up when all pain and tenderness have subsided, and there is evidence that the process of repair has become established.

It is often some time before local massage can be dispensed with.

In the Medical Annual 1916, page 390, Moll advises that when the tenderness of the nerves have subsided, the patient should be put on massage, active and passive movement, vibration and electric ionisation. Whitla (Dictionary of treatment, page 666) advises hot baths and all forms of counter irritation, friction, massage and electricity in the early stages of pain and tenderness are distinctly contra-indicated, as shoughing can be readily excited by these agents. In advanced cases, a water bed should be procured, and from the first, attention should be directed to correct by suitable and well padded splints any faulty position of the limbs caused by the contraction of unopposed muscles. In chronic and neglected cases where there is much wasting, and a high degree of paralysis occur, with contractures of muscles and deformity of limbs and secondary arthritic complications, he advises the following treatment:- Active faradisation of the affected muscles long continued, and perseveringly applied. Large moistened electrodes being used with a current strong enough to produce mild contraction of as large a number of fibres as possible in the partially degenerated muscles. Strychnine may be injected deeply into the centre of the muscles and the hot air or the electro-thermic bath or Tallermann's apparatus may be applied where there is much rigidity before beginning massage. Passive movement and Swedish exercises are ordered, and where these failed to reduce the contractions

surgical methods are resorted to. ~~Tab~~ Tubby (Deformities including diseases of the bones and joints, Vol. 2, page 772) advises, when there is a tendency owing to gravity and the weight of the bed-clothes, for the feet to point down-wards, and secondary contraction of the calf muscles and Tendo-Achillis, that the deformity can be anticipated and prevented by the following measures. Morning and evening the feet are passively dorsi-flexed, the affected muscles well rubbed and stimulated by the interrupted current, and the feet should be kept by a splint or a tin shoe at a little less than a right angle to the leg. On account of the weakness of the extensors of the knees and hips, contraction of these joints may occur and it must be prevented by ~~w~~ight extension, or by a Thomas's Hip-splint. When contractions have formed the propriety of dividing the tendons ought to be considered, but nevertheless operation should not be under-taken too early, for if the extensor muscles recover power, much of the contraction disappears on walking; if however, the deformity is persistent, tenotomy is called for. The wrist drop is treated similarly to the foot-drop. At the wrist a position of hyper-extension is aimed at, and in very severe cases, tenotomy of the flexors of the wrist may be required before hyper-extension can be obtained. The extensor muscles should be well massaged and rubbed, and it will often be found that, on trial, the patient can lift his fingers from the splint. This marks the beginning of recovery, which progresses until more or less complete power is regained.

In acute anterior polio-myelitis (Tubby, Deformities including diseases of the bones and joints, Vol. 2, page 613) in the second stage, at the end of six months all possible recovery in the central nervous system is nearly complete, and certainly in a year the lesion has become a cicatrix, and further improvement may be by the slow growth of muscle which has recovered under the stimulus of use. Maintain the nutrition of the muscles to the utmost degree possible by dry warmth and massage, electrical stimulation of muscles, systematic functional use of the muscles, relaxation of tension, and the prevention of stretching of muscle. For muscles the constant current is useful, and when the patient has drop foot, tell the patient to try and dorsi-flex, and help it along with gentle pressure. Some mechanical support is often necessary to enable the limb to carry out any movements. Malleable iron splints, bent or twisted to fit the part, where the angle can be altered from day to day to be used so as to oppose muscles which are becoming contracted, and immediately it is evident that a group of muscles is weakened, the part must be supported so that no stretching takes place. Recovery is always hindered, and even entirely prevented in a stretched muscle, but when it is relaxed, the reverse is the case. Therefore, in order to obtain the maximum amount of recovery in an affected muscle, relax it to its fullest extent, and massage it. Elongated muscles are early restored to power and use by maintaining them slack. Support the part by night as well as by day. In the chronic stage where there are contractures the treatment is mainly surgical.

Case No. 36, M.A.H, on admission showed a tendency to contracture in the arms, legs and feet, but by means of charcoal splinting applied to the limbs, with massage and movement, the tendency to contractures was combated and she has now no contractures, although she has still some paralysis.

Case No. 37, T.H.W, rapidly developed drop foot, and a tendency to drop wrist ten days after he was admitted. At once his legs and hands were placed on charcoal splints, the feet being placed at less than a right angle to the leg and the ~~firm~~ wrists dorsi-flexed in an over-corrected position. At first, because of the tenderness of his arms and legs, massage and electricity were not applied, but he was put on that treatment before he was transferred, and by then he had no contractures, and there was some improvement in the paralysis.

Case No. 38, A.M, had her Tendo-Achillis tenotomised on both sides, and her feet placed in charcoal splinting at less than a right angle to her legs. On the third day she was persuaded to get up and make an attempt at walking, and succeeded in making about a dozen steps with the help of two nurses who supported her. She was put on massage, movement and radiant heat, encouraged to make active movements against resistance, and passed part of the time in practicing various forms of Swedish movements. She has been increasing the length of her walk every day, until now (August) she can walk a number of times round the ward, with only her hand resting on a nurses shoulder for a support. Her legs are recovering from the paralysis and she has now no contractures. Her general health has now much improved.

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Case No. 39, L.A, very shortly after admission showed a tendency to drop foot and drop wrist, when immediately charcoal plate was applied to all her limbs, placing them in an over-corrected position. About nine days after, ^{the} splints were applied, ^{the} patient was so restless that her feet were put in Croft's splints and the hands in plaster of Paris, because the charcoal plate became loosened and she pulled them off. Two months later she was again put on charcoal splinting, and massage, movement and radiant heat were ordered. She has now no contraction and no paralysis, and is up and about all day.

Case No. 40, R.H.P. Immediately on admission charcoal splints were applied, placing the feet and hands in an over-corrected position. She is on massage, movement and radiant heat. This case came in some months after the drop wrist appeared, and it is thought that if this condition had been corrected immediately it appeared, much more rapid progress would have resulted. Now, (August) there is no paralysis in the upper limbs, and no contractures. The lower limbs show some slight improvement in the paralysis, and there are no contractures.

Case No. 41. J.F, had a drop wrist, and a tendency to drop foot on admission. He was immediately put on charcoal splinting, the hands and feet being placed in an over-corrected position. This was a very severe case of lead poisoning, and he is still paralysed, although he now beginning to get power, and he has no contractures. He has massage, movements and radiant heat vigorously applied at present.

Case No. 42. S.P. This was a case of contractures neglected for a long time. Each Tendo-Achillis had to be operated on and the feet put up in a partially corrected position. A Month later her feet were wrenched and the positions much improved, and plaster bandages again applied. The feet are now (September) in a good position, but the patient is very unenterprising, and still under treatment.

Case No. 43. A.L., No treatment is being given to this patient. He is a case of Friedreich's Ataxia.

Case No. 44, W.P. Here the treatment is being directed to the spinal condition, and nothing has been done for his contractures.

Case No. 45, J.K. This patient was put on extension by means of a stirrup of lead plaster with weight and pulley over the end of the bed, for some time. These have now been removed and he is getting massage, movement and radiant heat regularly. His locomotion is greatly improved and the contractures are improving.

In this class of case it is essential that preventative treatment for the contractures, especially in multiple neuritis and acute anterior polio-myelitis, should be started as soon as the disease is diagnosed. The longer the patient is allowed to have drop wrist or drop feet without correction, the greater amount of time and trouble will be necessary in getting the patient up and about again, and remedying his contracture. It is suggested that whenever it is noted that there is the slightest tendency to paralysis the upper and lower limbs should be placed in the position of the greatest rest for the muscles. The knees should be extended and the feet placed at slightly less than a right angle to

the leg. Croft's splints or plaster bandages are the best material to be used at first. When all pain and tenderness has disappeared, the plaster can be removed and charcoal plate, bent at the requisite angle, can be applied. These can then be removed when it is necessary to give the patient massage, radiant heat and passive movement. The patient should be encouraged to make movements against resistance, and various Swedish exercises should be taught him. If this treatment is persisted in, and thoroughly carried out, surgical procedure will not be necessary at any time, the period of convalescence will be considerably shortened, and complete recovery in a comparatively short time in most cases will be the rule. The patient should be placed under the best hygienic conditions, and the administration of Cod-liver-oil and tonics would be of benefit.

The next class of cases (class 4) the treatment for contractures is unsatisfactory. No type of splint or plaster has been found which will control the spasm and tendency to contracture. The pull of the muscles is too powerful, with the result that pressure sores develop, the patient complains of pain, and the various types of splints applied have become bent or broken in a very short time. In one case, No. 47, N.R, the injection of rectified spirit (alcohol 90%) into the main nerve trunks of the limb produced good results for a short time, but the improvement was only temporary and further investigation will be required before the value of this method of treatment can be decided. In the Medical Annual, page 525 (1914) there is a note on the treatment of spastic contractures. In operations for this condition there were 14 deaths, and 159 operations. Root resection was tried, and the results showed that the most unfavourable cases are disseminated sclerosis and rapidly progressive cord diseases, and also the arm cases show poor results. Better results were obtained in stationary diseases, and in which there was sufficient mental intelligence to carry out physical exercises afterwards. The first thing in operating is to find out the degree of paralysis in addition to spasm and this is done by injecting intraspinally Stovaine which abolishes the spasm and allows the degree of voluntary movement to be estimated. In spastic contractions of the leg Foerster holds that five roots ought to be cut. The usual ones are the second, third and fifth lumbar and the upper two sacral. The fourth lumbar is left because it guarantees the extensor reflex of the knee which is so necessary

for standing and walking. Sometimes the second and third may be this important root instead of the fourth sb, Foerster electrically stimulates the roots at the time of operation.

The percentage of deaths seems to be rather high in operating in this class of case, and evidence of better results will be necessary before this treatment finds general acceptance.

In Hemiplegic cases due to some intracranial lesion, (cases Nos. 48 to 66.) the treatment of the contractures, which ought always to be preventative, must be commenced at the very beginning, within a few hours or at the most a day or two ^{of} ~~after~~ the onset of the paralysis. There is very little in the literature looked up on the treatment of contractures of hemiplegics. Allbutt and Rolleston, System of Medicine, Vol. 8, page 301, mention that treatment must be directed to restoring the functions of those areas affected by the hemiplegia. The affected limbs must be passively moved at least once a day from the very beginning. If firm adhesion has occurred, it may be necessary to move a joint under an anaesthetic, and the patient will have to submit to some pain and discomfort to the daily passive movements. This trophic arthritic change is sometimes complicated with neuritis resulting in severe pain, wasting and a glossy skin. The pain is relieved by the application of glycerine and Bella donna, and when the pain has subsided the patient is put on the constant current with massage. The passive movements will counteract the inevitable tendency to contractures. Get the patient up as soon as convalescent and encourage

him to walk and use the affected limb as much as possible, and improvement often goes on at a surprising rate.

It is recommended that the patient be put on gentle massage and passive movement as soon as possible, after the hemiplegia has manifested itself. If there is pain and tenderness in the limb Allbutt and Rolleston recommend treatment with glycerine and bella donna. When the pain has subsided, massage, passive movements with radiant heat should be regularly applied. In three to six weeks the patient if possible should be got up and encouraged to move about and use his limbs. To prevent the tendency to contractures, charcoal splinting should be applied with the wrists and feet well dorsi-flexed, and the elbows and knees straight. This will prevent the contractures of these joints, and if the treatment suggested is thoroughly carried out, it is surprising how good the result is in many of the cases and how quickly the patient is able to resume his normal ways of life as long as he is prevented from taking a too strenuous part in it. Some cases however, seem to go rapidly from bad to worse, and no treatment however persistently applied will get them on their feet again, but a great deal can be done by the above treatment to prevent the contractures, although they may always remain paralysed. If the patient comes under treatment when the contractures are fully established, it may be necessary to resort to tenotomy of tendons (Case 56, C.C)(Case 61, M.J.H.) and even in these late cases good results may often be obtained, and the patient enabled to get up and about.

Sometimes in these late cases it is often not necessary when there are contractures to tenotomise any tendons (Case No. 62, M.F, No. 63, S.J, Case 64, G.F, Case 66, J.E.F). The contractures can be reduced at the ankles and wrists by means of charcoal splintings bent in conformity with the flexions and by gradual extension day by day the flexions can be gradually reduced. If the knee or thigh is contracted, it can be straightened by means of extension applied by a stirrup of lead plaster with weight and pulley over the end of the bed. With the addition of massage, passive movements and radiant heat and when the patient is not on extension getting him up and about and encouraging him to use his limbs, will often lead to quite good results being obtained.

In cases of paralysis agitans and senile paraplegia Whitla (Dictionary of Treatment, page 723) recommends massage, resistance movements, passive exercises and the continuous current. This prevents the approach of the chin to the sternum.

In the literature not enough attention has been paid to the dangers of allowing these cases to rest always instead of taking regular and systematic exercise. In senile paraplegia (Albutt and Rolleston, System of Medicine, Vol. 7, page 805) it is recommended in the muscular form that the patient be given gentle massage and passive movement together with occasional hot baths.

It is recommended that these cases be encouraged to take gentle exercise regularly. In the milder cases a quiet round of golf taken regularly or some such light method of taking exercise will keep the patient interested and improve his general health. Gentle massage daily applied followed by a hot bath is of benefit.

The rigidity and contractures come on with great rapidity if these patients are allowed to take no exercise, or be confined to bed. Even when they are getting old and feeble it is advised that at least for a short period of the day, the patient be encouraged to get up and move about as much as possible. (Cases 67 to 70)

In the contractures due to joint diseases, sometimes in the early cases, the pain is so severe that it is necessary for the patient to keep his limbs quite still. But great care must be taken to put the patient on vigorous treatment as soon as possible. Immediately pain and tenderness have disappeared, massage, active and passive movements, and radiant heat must be employed. If the patient be allowed to lie for any length of time in the position which is easiest for himself, the limbs will be flexed, and very soon contractures will develop. First of all the cause of the joint disease must be sought for and treated. It is sometimes very difficult to ascertain this cause, but in two of the cases mentioned, Case No. 76, E.G, and 79, M.B, pyorrhoëa alveolaris was evidently the primary cause. In these cases the teeth were extracted and the resulting joint lesion soon cleared up under the usual treatment. While there is pain and tenderness, it is recommended that charcoal splinting be

used to keep the elbows and knees straight, the feet at right angles to the legs, and the wrists slightly dorsi-flexed. If the hips are mainly affected, it may be necessary to keep them extended by means of a stirrup of lead plaster with weight and pulley over the end of the bed. If the shoulders are affected, the best position is to place a pad on the inside of the arm, so that the upper arm may be in a slightly abducted position. When the back is affected, these patients often find the most comfortable position is partially upright resting on pillows. In these cases the patient should be laid flat.

Whenever pain and tenderness have subsided, massage, active and passive movements, should be systematically and vigorously carried out and the patient made to get up every day by degrees, until he is up all day, and encouraged to use his limbs as much as possible. The great difficulty with many of these patients (Cases 73, A.P., 74, E.B., 75, S.K., 77, J.T) is a certain mental condition which appears to be confined to this type of patient. They will not get up and about, or do anything for themselves, and the trouble and time expended on them to try and enable them to be of some use to themselves and others, is all lost. In these patients treatment has been persisted in over long periods, but if, for one day the attention is relaxed, it is found that they are quite content to lie in bed and some of them are even too lazy to feed themselves.

In cases of this type which have been neglected for a long time, it may be necessary to divide tendons, to enable the limbs to be placed in a reasonably good position. In case 71, J.T.P, although already a great deal has been done with massage, movement and radiant heat, and extending and moving the joints as much as possible, under an anaesthetic, it will be necessary to divide the tendons in front of, and behind the ankle, in order to get satisfactory results.

In some cases, (Cases 72, L.H,) owing to the nature and severity of the joint lesion it is quite hopeless to attempt treatment so that they may become useful members of society. Still even in this case some progress has been made, especially in the arms and hands, for the patient can now write letters for several hours at a stretch, whereas before treatment was undertaken she was unable to write for more than half-an-hour at a time. The fingers are very much deformed, but with massage, movement and radiant heat some of the stiffness has been overcome, and the writing does not tire her to anything like the extent that it did. She is got up every day for a couple of hours, and this is also of benefit, for it raises her spirits and gives her more interest in life knowing that she is getting up every day, and being wheeled into the open air, on a couch. She also feels that something is being done for her,

In cases of Talipes Equino Varus (Thomson and Miles, Vol. 1, page 812) it is recommended that as soon as the viability of the infant is beyond question, treatment should be directed to the reduction of the deformity.

21.
Manipulations are advised twice or thrice daily, and the limbs are massaged and douched. At the end of two or three months assistance maybe derived from the use of simple lateral poroplastic or alluminium splints, with a foot piece. This ought to allow the child when he begins to walk, for the sole to be brought into contact with the ground, and the weight of the body will help to correct the deformity. If the Equinus element persists, the Tendo-Achilles may be lengthened. The turning in of the toes is best over-come by strapping the feet at night to a wooden board, with the whole lower limb rotated outwards, so that the toes of each foot point directly outwards. The younger the child, the more completely and easily the deformity can be rectified.

It is thus seen that these congenital cases of contractures as regards treatment, fall into line with the types of case mentioned in this Thesis. The sooner treatment is begun, the more rapid and complete are the best results obtained, and the more systematically and perseveringly the treatment is carried out, the sooner will the patients return to normal, be effected. This is the same in all the types mentioned, and there is no case however severe the contractures, which cannot be greatly benefited by some ^{of the} forms of treatment above mentioned.

In the first class of cases mentioned where there is a simple atrophy from disuse, the pathology differs from that in all the other types mentioned. There is very little fibrous tissue formed, and therefore no true contractures are present; the muscles of the part and the other structures in connection with it undergo simply an atrophy from disuse.

The endeavour in this thesis is to show that the local pathology present in all the types of cases, except the first, is a condition allied to Volkmann's Ischaemic Contracture. The contraction of the muscles of a part follows an alteration in the blood supply and there is venous stasis and diminished arterial flow. This may be due to many causes, but whatever the cause the contractures follow in due course. The following have been noted:-

The true Volkmann's Ischaemic contracture due to a tight bandage or ill fitting splint; A partial cutting off of the blood supply of the Sterno-Mastoid branch of the Superior Thyroid artery as in Congenital Torticollis.

Chronic inflammation as seen in ulcers of long standing; thrombosis of veins especially in the lower third of the leg; pressure by lead plaster when using extension; plaster bandages applied too tightly; some vaso-motor disturbance dependant on some lesion of the central nervous system as in Hemiplegia; a chronic inflammation in connection with joints as seen in the last class of cases mentioned.

In all these cases there is a diminished arterial flow and a venous stasis and if this condition occurs it soon leads to a proliferation of the connective tissue cells of the part affected, which is followed by a formation of fibrous tissue, at first round bundles and then enveloping individual muscle fibres until enough fibrous tissue forms and

this contracts and gives rise to the deformities known as contractures. The sections obtained post-mortem show changes seen in sections from muscle obtained in cases of Volkmann's Ischaemic Contracture, where there is a gradual disappearance of muscle fibres, increase of interstitial connective tissue, and replacement of the fibres by the same substance. The muscle is more or less replaced ultimately by connective tissue, and as time goes on the cicatrix becomes harder and shorter. Clinically this hardness is very evident in a great number of the cases under consideration, and shortening of muscles is often noticed to an extreme degree. It is unfortunate that more sections could not be obtained post mortem, but it is probable that when more are obtained, they will show similar changes, as seen in those already examined.

The treatment in every case is practically similar. It is begun as soon as possible, within a few hours or at most a few days of the onset of the disease. In some cases like those of neuritis, ulceration and hemiplegia, for some reason or another, such as pain which will prevent the systematic use of massage, some time must elapse before treatment for the threatened contractures is under-taken, but the sooner massage, manipulations and radiant heat are begun the quicker good results will be obtained. Charcoal splinting is most useful for helping to reduce the deformities due to contractures, which have already occurred, and also prevents the onset of contraction in cases where drop wrist, or drop foot and other paralysees are beginning to occur.

The aim in all these cases should not be the cure of the contractures when they occur, but their prevention, and when a patient first comes under treatment, if it is a case where contractures are likely to occur, suitable measures must always be taken, in view of the possibility of them occurring. There is seldom any necessity for surgical interference in cases treated early, but some cases occur so rapidly, that if this complication is not anticipated the contractures may be so severe that tenotomy may be called for.

It is suggested that the hemiplegic and neuritis cases, as soon as the disease is diagnosed, the parts likely to be affected should be placed in the easiest natural position and kept there by means of charcoal splinting, Croft's splints, or plaster of Paris bandages. The latter two methods are recommended when there is any mental condition of the patient. In neglected cases, when the contractures are severe, it may be necessary, especially when the lower limbs are affected, to reduce the contractures by means of extension applied with a stirrup of lead plaster and weight and pulley over the end of the bed. Ofcourse when this is necessary, massage and radiant heat cannot very well be **applied** at the same time. This method however, sometimes increases, through pressure, the amount of fibrosis present, as seen in cases of fractured femur, where a condition allied to Volkmann's Ischaemic Contracture often occurs. Massage, passive movement and radiant heat are all invaluable in promoting the restoration to function, of the part. They must be regularly and persistently used, sometimes over long periods but the results obtained,

justify the time and work spent on these patients. Even in cases of long standing (Case No. 38, A.M) sometimes very rapid recovery takes place, but there are other cases, especially if neglected for a long time, which require much patience and persistence for long periods, perhaps taking months, and even years to get a good result.

When a contracture of a limb has been present and neglected for some time, or as in Volkmann's Ischaemic Contracture, the deformity comes on rapidly, and it is often severe, the most suitable way of straightening the affected part is to gradually reduce the contracture. In the case of the upper limb, charcoal splinting is applied and first the terminal phalanges are straightened by fixing them to the splint, and this process is gradually carried out by bending straight the splint on the back of the limb, taking each joint in turn, from the distal to the proximal end. The knees and hips when flexed are usually straightened by means of plaster applied as a stirrup with weight and pulley over the end of the bed, but the feet, when in a position of Talipes Equinus, are gradually dorsi-flexed by bending the splint towards a right angle day by day.

When tenotomy is used the joints are placed in the proper position and kept there by charcoal splinting, which is removed when massage, movement and radiant heat are being applied.

The patient is always encouraged to help himself. He makes movements against resistance, and various Swedish exercises are taught him. This is an important adjunct to the treatment, for when he is able to get up and

about he takes a much keener interest in his treatment, and his recovery goes on rapidly.

It is very fatal, especially in cases of joint disease to allow a patient to stay in bed for some time, and so get used to doing nothing for himself. It then often takes much time and trouble to educate the patient to take an interest in his future treatment, and any recovery taking longer to manifest itself, is in itself discouraging to the patient.

Paraplegic cases of the spastic type are disappointing in the results of treatment. Alcohol injected into the nerves supplying affected muscles has been tried as well as all the other methods of treatment mentioned, but no lasting results have been obtained and some other way of combating these contractures will have to be devised. In the senile paraplegias and paralysis agitans cases, the very worst treatment is to allow them to stay in bed always. If they are made to get up every day, even for a few hours, contractures and rigidity leading to absolute helplessness is defeated for quite long periods. The rigidity comes on with extraordinary rapidity if they never get up.

In the joint cases the more the patient moves about, the better, and he should be got up and made to perform some daily task, or if of independant means, encouraged to take up some hobby which will keep him in sufficient exercise and with some interest in life.

Appendix.

Case No. 1.

W. G. age 42. Ward B1. Admitted 12/5/09.

Diagnosis:- Ulcer of Leg. Inguinal Hernia.

State on admission. Large ulcer of left leg with much cellulitis round it. Large irreducible inguinal hernia.

Patient refuses to do anything to help himself.

15/8/09. Ulcer healing very slowly. Ulcer due to varicose veins.

2/1/10. Ulcer quite healed.

14/5/16. During these years patient has consistently refused to have his hernia operated on and has never walked or used his lower limbs in any way. He has had attacks of sickness and vomiting at various intervals since admission which were evidently associated with partial obstruction of his hernia. He has no contractures of any kind, and there is no limitation of movement in any of his joints. His reflexes are normal and in fact there has been nothing wrong with him for years except the enormous right inguinal hernia which when fully down reached as far as the junction between the middle and lower thirds of his thigh.

9/6/16. Patient operated on. A filigree inserted after Mc. Gavin's method.

15/7/16. Patient up and being compelled to walk about with the help of nurses. Vigorous massage of his lower limbs daily.

20/8/16. Patient discharged quite fit to follow his occupation of labourer.

Case No. 2.

A. C. age 86. Ward I. 2. Admitted 10/5/15.

Diagnosis:- Arterio Sclerosis.

This patient is an old, feeble, woman with arterio sclerosis. She has been in bed a year now (3/6/16) and she shows no signs of any contractures and there is no limitation of movement in any of her joints. There is much atrophy of the various structures of her lower limbs.

Case No. 3.

M.C.W. age 70. Ward I.1. Admitted 16/10/14.

Diagnosis:- Scoliosis. Kyphosis. Arterio Sclerosis.

Atrophic scirrhus both breasts.

State on admission. Lungs, respiratory murmur faint. Heart, Sounds faint, regular. Arteries, walls thickened. Kyphosis and Scoliosis in dorsal region. Eyes, pupils react to light. Knee jerks diminished. This patient for some unknown reason has been in bed for the last 27 years. She refuses to get up and the probabilities are that it has been less trouble to allow her to stay in bed than to compel her to get up every day. She has no contractures and no limitation of movement in any joint. Her limbs are greatly atrophied. She is now getting up every day, which combined with massage will, it is hoped, make her walk again.

Case No. 5.

G. G. Age 64. Ward B1. Admitted 17/6/15.

Diagnosis:- Tabes Dorsalis.

History of five years symptoms. All classical signs of tabes present. Small trophic ulcer on the ball of left big toe. No contractures.

Case No. 6.

J.B. age 61. Ward B2. Admitted 27/5/15.

Diagnosis:- Tabes Dorsalis.

Symptoms for "years". Perforating ulcer on sole of right foot. Knee jerks abolished. Argyle-Robertson pupils. No contractures.

Case No. 7.

W. A. Age 40. Ward E. Admitted 2/7/15.

Diagnosis:- Tabes Dorsalis.

Knee jerks abolished. Rhombergism present. Pupils small and unequal and do not react to light. No contractures.

Case No. 8.

F.P. Age 63. Ward E. Admitted 28/6/15.

Diagnosis:- Tabes Dorsalis.

History of two years symptoms. Perforating ulcer on ball of left big toe. No contractures.

Case No. 9.

E. Q. Age 61. Ward E. Admitted 7/6/15.

Diagnosis:- Tabes Dorsalis.

History of two years symptoms. Internal ear deafness.

Knee jerks abolished. Pupils react sluggishly to light. No contractures.

Case No. 10.

S. S. Age 76. Ward K. Admitted 31/7/15.

Diagnosis:- Tabes Dorsalis.

No history. Knee jerks abolished. Perforating ulcer on ball of right big toe. No contractures.

Case No. 11.

L. W. Age 59. Ward G1. Admitted 12/5/15.

Diagnosis:- Tabes Dorsalis, and Aortic Aneurism.

History of five years symptoms. Knee jerks abolished.

Doubly incontinent. Abdominal aortic aneurism present.

No contractures..

Case No. 12.

E. B. Age 65. Ward C. Admitted 11/8/15.

Diagnosis:- Tabes Dorsalis.

No history. Knee jerks abolished. Incontinent.

Pupils react sluggishly to light. No contractures.

Case No. 13.

T. L. Age 42. Ward E. Admitted 30/7/15.

Diagnosis:- Tabes Dorsalis.

Patient gives no history. Pupils do not react to light. Knee jerks abolished. Perforating ulcer on sole of left foot. No contractures.

Case No. 14.

A. S. Age 52. Ward K. Admitted 27/9/15.

Diagnosis:- Tabes Dorsalis.

History of one years symptoms. Left knee jerks abolished. Right knee jerks greatly diminished.

Pupils small, equal and do not react to light.

Rhombergism present. No contractures.

Case No. 15.

J. H. Age 61. Ward Dk. Admitted 14/6/15.

Diagnosis Tabes Dorsalis.

History of a few months symptoms. Lightning pains in legs. Knee jerks abolished. No contractures.

Case No. 16.

T. H. J. Age 42. Ward B1. Admitted 29/12/15.

Diagnosis:- Tabes Dorsalis.

Several months history of "staggering". Occipital headache for five weeks. Pupils equal and react sluggishly to light. Complete paralysis right external rectus. Knee jerks abolished. Specific Choroiditis both eyes. No contractures.

Case No. 17.

F. S. Age 46. Ward B1. Admitted 25/11/15.

Diagnosis:- Tabes Dorsalis.

History "Syphilis when a boy" Symptoms of Tabes for five years. Lightning pains in legs. Tabetic gait. Knee jerks abolished. Small perforating ulcer on sole of right foot. No contractures.

Case No. 18.

E. E.T. Age 65. Ward R. Admitted 11/11/15.

Diagnosis:- Tabes Dorsalis.

No history obtained. Knee jerks abolished. Pupils do not react to light. No contractures.

Case No. 19.

A. H. Age 52. Ward C2. Admitted 21/10/15.

Diagnosis:- Tabes Dorsalis.

History of symptoms for 12 years. Pupils fail to react to light. Knee jerks abolished. Inco-ordination of arms. No contractures.

Case No. 20.

G. T. Age 62. Ward B1. Admitted 10/10/16.

Diagnosis:- Tabes Dorsalis.

History of four years symptoms. Knee jerks abolished. Girdle pains present. No contractures.

Case No. 21.

M. E. P. Age 42. Ward H2. Admitted 23/9/15.

Diagnosis:- Tabes Dorsalis.

History of symptoms for two years. Charcots joints both knees with bony enlargement. Left patella

displaced outwards. Deformities of both joints. Both knees flexed.

Case No. 22.

M. C. Age 61. Ward Dk. Admitted 19/3/16.

Diagnosis:- Tabes Dorsalis.

Patient has been in this Infirmary several times for venereal diseases. Marked Rhombergism. Right knee jerks abolished. Pupils do not react to light. No contractures.

Case No. 23.

A. H. Age 49. Ward O. Admitted 18/5/08.

Diagnosis:- Tabes Dorsalis.

Several years history of symptoms.

17/4/12. Occasional incontinence. Pin point pupils not reacting to light. Lower limbs weak and flail like. Charcots ankles and knees. Sensation of legs and thighs impaired.

27/10/15. Inco-ordination of arms. Knee jerks abolished. Both Tendo-Achilles contracted. A condition of Talipes Equinus.

Case No. 24.

G. A. B. age 4. Ward A1. Admitted 22/3/16.

Diagnosis:- Separation of Epiphyses lower and left
Humerus.

Admitted with a straight splint applied to the left arm. An ill fitting splint very tightly applied without sufficient padding. Arm much swollen. Blebs on forearm in various places. Arm very dirty.

29/3/16. Arm much less swollen and cleaner. X Rays show separation of lower epiphysis of left humerus with backward displacement of the fore-arm. Arm places in a position of acute flexion at elbow.

21/4/16. Volkmann's Ischaemic Contraction present. Charcoal splinting applied and flexion at the various joints to be corrected by starting at the fingers. Radiant heat to be applied daily with massage and passive movements.

7/8/16. Fingers extended and wrist extended to an over corrected position on the charcoal splint. Elbow by means of massage, radiant heat, and passive movements has now free movement. There is still a slight tendency to flexion on bending the wrist of the terminal phalanges. Grip becoming more powerful. Patient moves the elbow, wrist and finger joints freely.

Case No. 25.

W. G. H. age 67. Admitted. 1/2/16. Ward B2.

Diagnosis:- Chronic septic arthritis of knees and ankles of both legs.

12/2/16. Apparently a chronic septic arthritis of knees and ankles. There is some ankylosis with the oedema of subcutaneous tissue. Legs and thighs very hard and tissues cannot be dented by the finger. Has severe pain rendering all measures of treatment troublesome. Early in his disease some years ago this patient was treated by prolonged extension applied by means of a stirrup formed of lead plaster and weight and pulley over the bottom of the bed. He was originally diagnosed at a case of gout. He is really a septic arthritis. This condition of stiffness of the joints and hardness of the softer tissues is probably a condition allied to Volkmann's Ischaemic Contraction. Xrays shows no disease in the joints other than a very slight degree of osteo-arthritis.

Massage started.

19/2/16. Radiant heat and massage tried as a preliminary.

26/2/16. Appears to be some improvement.

13/5/16. Much less swelling of legs. More movement at ankles. No movement at the knees.

19/8/16. Patient up daily. Knees still fixed. No swelling of legs. Much more comfortable. Now free movement at ankles and hips.

Case No. 26.

S. H. Age 59. Ward R. Admitted 4/4/16.

Diagnosis:- Fractured neck of femur.

11/4/16. X Rays shows fracture through great trochanter.

Patient put on a Hodgen splint.

26/5/16. Splint removed yesterday. When stirrup taken off it was found that the whole lower limb was very hard and the joints very stiff. The muscles could not be dented with the fingers and this condition appears to be allied to Volkmann's Ischaemic Contracture.

Patient put on massage and radiant heat with passive movements and encouraged to get about as much as possible. There is about one inch shortening of the limb.

20/6/16. Improving. Has a sole placed in her boot. Walking better. Thigh not so hard. Knee, ankle and hip not so stiff.

19/8/16. Patient getting about very well. Thigh almost as soft and supple as a sound one. Some stiffness still at the hip. Soft structures in region of ankles still very hard. Fairly free movement at knee and ankle. This patient shows decided improvement and it is hoped that in a month or two she will be able to get about as freely as she did before her accident.

Case No. 27.

S. M. age 72. Ward O. Admitted 3/8/16.

Diagnosis:- Sprained ankle.

Right leg and ankle in plaster, reaching from anterior tibial tuberosity to metatarsal phalangeal joints.

Supposed to have broken her leg a month ago at Southend. She had a "cradle" for a fortnight and afterwards leg was put in plaster.

4/8/16. Plaster removed. Limb on being XRayed showed no fracture. The lower half of the leg is very hard and swollen. Ankle very stiff with great limitation of movement. Dorsum of the foot swollen. The plaster was on very tightly and this appears to be a case allied to Volkmann's Ischaemic Contracture.

20/8/16. This patient has been treated for the last fortnight with radiant heat, massage, and has been encouraged to move about as much as possible. There is more movement at the ankle joint. The soft tissues are not nearly so hard. The patient is walking about and using her leg fairly well, but with some discomfort, for there is some pain on movement at the ankle.

29/8/16. Patient moving about freely. No pain now on walking. No limitation of movement at ankle.

Case No. 28.

J. E. age 79. Ward B1. Admitted 14/3/16.

Diagnosis:- Fractured neck of femur.

22/4/16. XRays show an intracapsular fracture of the neck of the femur. Hodgen splint applied.

3/5/16. Splint removed. Patient does not make much effort to help himself. Patient to be treated with massage, movement and radiant heat. He is to be encouraged to use his limb as much as possible.

Feeble mentally and physically. Muscles of lower limb very hard and cannot be dented with the finger. Ankle and knee very stiff. This appears to be a condition allied to Volkmann's Ischaemic Contracture.

20/8/16. Patient improving. Still some limitation of movement. Muscles of the posterior aspect of the leg still hard. Thigh muscles soft. No limitation of movement at knee. Patient getting about fairly well.

Case No. 29.

S. B. age 63. Ward I.1. Admitted. 7/6/16.

Diagnosis:- Gout.

The left shoulder, elbow and proximal interphalangeal joint of the middle finger are dusky, swollen, painful and tender with limitation of movement. Patient has had the same thing in different joints at different times, especially in her big toes. The dorsum of the right foot is covered with a scar which has been there for many years. This scar started as a small septic spot which healed, but others followed in rotation until the whole dorsum was converted into a scar. At present there are five small areas about the size of a three penny bit on each of which is a dry scab covering a slightly moist septic area underneath. The Extensor Hallucis tendon has become involved in the scar tissue and stands out like a cord on the dorsum of the toe, keeping the right big toe permanently

dorsi-flexed.

Treatment. This patient was put on massage, movement and radiant heat, and it would probably have been necessary to tenotomise the tendon, but the patient was dissatisfied with her treatment and took her discharge.

Case No. 30.

A. B. age 35. Ward I.3. Admitted 18/5/16.

Diagnosis:- Phthisis.

Right leg shows evidence of old disease, probably tubercular. There is a scar over the upper third of the right fibula which discharged for months, when a child. On the lower third and anterior aspect of the right tibia there is a heaped up horny area three inches by two inches, by half an inch thick. This area also discharged for months at the same time. There is a condition of Talipes Equinus of the right foot. The Tendo-Achilles is contracted. Great limitation of movement at the ankle. Free movement at Tarso-metatarsal joints.

The treatment ordered was massage, movement, and radiant heat, with a probability of having to divide the Tendo-Achilles, but the patient took her discharge within a few days.

Case No. 31.

A. F. age 28. Ward Q. Admitted 21/3/16.

Diagnosis:- Varicose ulcers.

Patient's left ankle rigid. No movement. Ankle painful on attempting to move it. The foot is plantar-flexed and inverted. Two small ulcers on left leg, one on

the front of the tibia, the other just below the external malleolus.

31/3/16. Ulcers healed. Limitation of movement of ankle and tarsal joints of left foot. X-rays show no ankylosis.

27/4/16. Left Tendo-Achillis lengthened one and a half inches. Foot placed at right angles and held in position with charcoal splinting.

9/5/16. Wound healed. Patient up and about and using the leg freely. She is having massage, movement, and radiant heat daily. The splint is applied at nights.

29/8/16. Patient has completely recovered the use of her limb. Free movement at ankle joint and there is no pain and no discomfort.

Case No. 32.

J. P. age 70. Ward C2. Admitted 12/5/16.

Diagnosis:- Arterio Sclerosis.

Accident to left ankle five years ago, when he slipped off the edge of the pavement. The ankle was not fractured, but was very painful and swollen for some weeks. He did not go to bed and he has been lame ever since. The Tendo-Achillis is much contracted on the left side. Foot in a position of Talipes Equinus. Muscles and tendons on the sole of foot contracted, especially the long flexors of the toes. There is great limitation of movement at the ankle joints. The Extensor Longus Hallucis tendon is contracted.

14/5/16. Patient died today.

Pathology. Section of left Extensor Longus Hallucis muscle - no fibrosis. Fibres greatly atrophied. Some fibres show hyaline degeneration. Section of Right Extensor Longus Hallucis muscle - some fibres atrophied. Very little change.

Section right Gastrocnemius muscle (unaffected side) Some fibrosis. Many muscle fibres swollen in patches. Many muscle fibres atrophied.

Healthy and atrophied fibres mixed up.

Arteries walls much thickened, External coat most affected. Inner coat little affected. The sarcolemma shows proliferation of the nuclei in connection with it.

E. S. age 47. Ward 1.1. Admitted 31/22/15.

Diagnosis:- Bed-sores. Venous thrombosis of both legs. Illness started six weeks ago with a pneumonia, and during convalescence patient developed venous thrombosis in the lower third of both legs. Varicose veins for years. Six weeks in bed before being admitted.

State on admission: Heart, mitral systolic. Lower third of both legs hard, swollen, tender and painful. Painful red tender swelling in the left groin. Right thigh tender. Bed-sore on the right buttock about the size of a five shilling piece.

18/1/16. The bed-sore increased in size with great rapidity. There is a sinus running into the left buttock where there is an enormous fluctuating area. There is an abscess in the lower end of the left thigh. Both abscesses freely opened drainage established.

Tendo-Achillis contracted on both sides. Foot cannot be dorsi-flexed.

21/1/16. Developed a large abscess on the anterior aspect of the middle third of the right thigh. This opened, pus evacuated and drainage established. This abscess connected by sinus with the bed-sore on the right buttock. These abscesses are a Bacillus Coli infection.

28/3/16. Large fluctuating swelling developed in region of ninth, tenth, eleventh and twelfth ribs, one and a half inches laterally from the spine on the right side, and connected with the right buttock bed-sore by sinus.

1/7/16. Patient died from septic absorption.

This case shows the rapidity of onset of contractures when the blood supply of a part is interfered with. This condition of contraction of the Tendo-Achillis is probably allied to Volkmann's Ischaemic Contracture. The treatment necessary would have been ^{tenotomy} of the Tendo-Achillis on both sides. She would have attempted to walk about the seventh day, and would have been put on massage, movement and radiant heat, with charcoal splinting to keep the foot at right angles to the leg, while in bed.

Case No. 34.

E. H. age 44. Ward I.2. Admitted 29/6/16.

Diagnosis:- Varicose Ulcer of Leg.

Varicose veins first noticed about the age of puberty. There is a large ulcer, irregular in outline, extending over the external malleolus on the left leg. Enlarged, tender, hard glands in the region of the saphenous opening. The left knee is flexed with limitation of movement and the ham strings are contracted. The left ankle is fixed with the foot in position of Talipes Equinus. There is much thickening and induration of the soft tissues in the lower third of the left knee and round the ankle and the dorsum of the foot. The left Tendo-Achillis is contracted. The left Extensor Longus Hallucis tendon is contracted and the big toe is dorsi-flexed. The ulcer is a callous one, and in a stationary condition. There is a history of ulceration in the lower third of the left leg, for the last sixteen years. For five or six years now, patient has walked with her heel drawn up, resting her weight on the balls of the big and little toes, and in walking

her knee is flexed. She complains that she had to keep the leg in this position when walking because the "leaders" were too tight.

Treatment: Extension with a stirrup made of lead plaster with weight and pulley over the end of the bed after the ulcer has ~~been~~ healed. Tenotomy of the Tendo-Achillis when the knee is straightened, and the use of charcoal splinting to keep the foot at right angles to the leg when in bed. Massage, movement and radiant heat applied to the limb to get rid of the induration and stiffness of joints. It may be necessary to tenotomise the Extensor Longus Hallucis tendon. Once the knee is straightened and there is free movement of this joint, the patient will be made to get up, and use her limbs freely.

Case No. 35.
M. P. age 84. Ward #2. Admitted 31/8/15.

Diagnosis:- Tertiary Syphilis.

Admitted from another Infirmary, where she has been in bed for five years. Signs of old syphilitic ulceration on legs and knees. Severe contractures present. Right knee- flexed and contracted. Ham strings stand firmly out on attempting to straighten the leg. Right ankle-Tendo-Achillis contracted. Foot in a position of Talipes Equinus. There is free lateral movement at the ankle, but great limitation of movement in the direction of dorsi-flexion. Big toe dorsi-flexed, with contraction of the Extensor Longus Hallucis tendon. Left ankle-Tendo-Achillis contracted. Lateral movement free. Limitation of movement on dorsi-flexion.

Treatment: Patient too old and feeble for treatment.

Case No. 36.

M. A. H. age 35. Ward G3. Admitted. 28/2/16.

Diagnosis:- Peripheral Neuritis (alcohol)

Very tremulous. Uncertain in her statements. Memory quite good. Liver much enlarged. Knee jerks brisk. Tremor in legs. Irregular Pyrexia.

29/3/16. Patient shows a tendency to drop wrist and drop foot. Charcoal splinting applied to fore-arm and hands, which being bent slightly at the wrist (backwards) corrects the tendency to drop wrists and puts the hands in an over corrected position, being slightly dorsi-flexed at the wrists. Splints also applied to the legs and feet to keep the feet at slightly less than a right angle to the leg.

10/5/16. Calves not now tender. Patient put on massage, passive movement and encouraged to make voluntary movement against resistance.

22/7/16. Patient doing very well. She is rather feeble and there is some mental disturbance. Paralysis improving.

30/8/16. Paralysis very much better. There are no contractures. Patient is getting Cod Liver Oil and Malt. Alcohol has been absolutely withheld since admission.

Case No. 37.

T. H. W. age 34. Ward C1. Admitted 13/5/16.

Diagnosis:= Peripheral Neuritis (Alcohol)

Memory affected. Disorientated for time and place.

Knee jerks absent. Illusions of memory. Shooting pains in the legs. Marked tenderness in the calves.

Ten days after this patient was admitted he rapidly developed drop foot and a tendency to drop wrist.

At once his legs and hands were placed in charcoal splints in an over corrected dorsi-flexed position.

He had very little pain but his calves were very tender so massage, movements and electricity were not indicated. Alcohol was rigidly withheld the diet was light and nutritious.

12/6/16. Very little tenderness in calves. Ordered massage, passive movements and encouraged to use his limbs against resistance. His general condition has greatly improved. His mental condition shows no improvement and he still has illusions of memory.

5/7/16. Patient is a soldier and has been discharged as the Military Authorities have taken him to one of their Hospitals. He was getting on very well, for he was regaining the motor power in his limbs and he had no contractures.

Case No. 38.

A. M. age 59. Ward I.1. Admitted 16/10/15.

Diagnosis:- Peripheral Neuritis (Alcohol)

State on admission. Pupils react sluggishly to light.

Knee jerks diminished. Both feet plantar-flexed.

Each Tendo-Achillis contracted.

History. Difficulty in walking for ten years.

Attended an Infirmary five years ago where patient was diagnosed as Tabes Dorsalis. She was put to bed and kept there.

After being under observation for a week patient was given a general anaesthetic and the Tendo-Achillis on each side was tenotomised. Each foot was placed at less than a right angle to the leg and kept in that over corrected position by means of charcoal splinting. She was ordered massage and passive movement. On the third day the patient was persuaded to get up and make an attempt at walking, and succeeded in taking about a dozen steps with the help of two nurses who supported her. For some hours afterwards the feet and legs were very painful but her delight at the prospect of being able to walk once more encouraged her to keep on trying every day and she has increased the distance till in three weeks she can walk twice round the ward twice daily. She cannot yet walk without some-one to support her but there is now very little pain

after her attempts and her atrophied muscles are now filling out. The XRay photographs taken on her admission show an extreme rarefaction of the bones of the feet. At times after the operation she suffered great pain in her feet and legs and seven days after she attempted to walk her left foot swelled considerably. In spite of these things there was no diminution in the efforts to get her up and the result has justified the measures used to keep her regularly exercised.

30/8/16. This patient is greatly improved. She now walks with very little support. She is not quite steady on her legs but goes round the ward, her only support being a hand placed on ^{the} ~~her~~ shoulder of a nurse. Her legs, thighs and feet are being vigorously massaged. She is encouraged to ~~make~~ active movement against resistance and is practicing various forms of Swedish Movements. Medicinally she is taking Cod Liver Oil and Malt and a combination of the three Syrups. Her skin is now clearer, she is putting on weight, her lower limbs are filling out and on the whole her general condition is greatly improved.

Case No. 39.

L. A. age 40. Ward G³. Admitted 20/7/15.

Diagnosis:- Cirrhosis of the Liver. Peripheral Neuritis
(alcohol)

Patient can give no account of herself. Jaundiced.

Enlarged liver and spleen.

22/7/15. Delirious and troublesome.

3/8/15. Patient has a tendency to drop foot. Charcoal splinting applied to all limbs, the feet and hands being dorsi-flexed.

12/8/15. The feet put in Croft's splints and the hands in plaster of Paris.

13/10/15. Splints removed and hands and feet again put on charcoal splinting. Patient ordered massage.

23/1/16. Patient now walking about without splints, which are applied at night.

12/5/16. Arms appear quite recovered. No drop wrist. Some stiffness and slight flexion at knees. Some slight contraction of Tendo-Achillis.

7/9/16. Patient has now no contractures, and has completely recovered from her paralysis. There is no stiffness at the knees. Patient is up and about all day.

Patient has had light nourishing diet all the time and alcohol has been rigidly withheld. Her general health is much better and her mental condition has greatly improved.

Case No. 40.

R. H. P. age 19. Ward O. Admitted 16/10/15.

Diagnosis:- Peripheral Neuritis. (Post scarlatinal)

A history of scarlet fever and chorea. Patient had chorea before and after the scarlet fever. About four months ago she went to the Infirmary with chorea. Three months ago numbness started in the right hand, then affected the other hand, and then the feet became numb. This was followed by pains in the hands and feet. Then followed foot drop and after that wrist drop.

22/10/15. Charcoal splints applied to hands and feet which were dorsi-flexed in an over corrected position, the splinting keeping them in this position. Patient placed on a light nutritious diet and as she has no pain and only slight tenderness she is not placed on a water bed. Medicinally she is ordered Cod Liver Oil and Malt and a combination of the three Syrups.

4/11/15. Recovery from the drop wrist.. Still having vigorous massage every day since admission. There is great wasting of the muscles of the arms and hands, and of the legs and thighs. Drop feet still persisting with a tendency to contraction of each Tendo-Achillis.

1/4/16. Upper limbs doing very well. Muscles are filling out and the arms are fatter. The grip is not very powerful, but there is so much improvement that she has discarded the splints. She is encouraged to make movements against resistance. As regards the feet, she is just beginning to make slight voluntary movements.

2/9/16. Arms and hands almost completely recovered. The Thighs and legs are filling out extremely well. She can now lift her legs from the bed and can move the foot freely in all directions. Her weight has increased over two stone since admission and although she is not yet able to walk there is no doubt that very soon she will completely recover the use of her lower limbs in the same way as she has already done in her upper limbs.

Case No. 41.

J. F. age 29. Ward B1. Admitted 22/3/16.

Diagnosis:- Peripheral Neuritis (Lead)

State on Admission. Patient is a compositor. Slight strabismus. Double drop wrist. Knee jerks abolished.

Faint blue lines on gums. Slight colic present.

Herpes Zoster on the inner side of the right thigh.

Complains of pains in the arms and legs. Tendency to drop foot. No previous attacks of lead poisoning.

5/4/16. Legs and arms paralysed. Face smooth and expressionless. Albumen in the urine.

Charcoal splinting applied to the hands and feet keeping them in an over corrected position of dorsi-flexion.

12/5/16. Patient ordered massage daily and passive movements. Has very little power in his hands and feet. Has severe encephalopathy. Complains of insomnia. There is no colic or indigestion and his bowels are regular. Medicinally he is being treated with Iodides. He is encouraged to make movements against resistance.

14/8/16. There is some slight improvement in his condition both generally and locally. He has a marked tendency to contractures of each Tendo-Achillis. The fingers of both hands are stiff and there is a great tendency to contracture of the left elbow.

4/9/16. Patient is still paralysed. He is beginning to regain power in his arms and legs. The tendency to contracture has been over-come. It is hoped that in about a year's time he will have completely recovered the use of his limbs and he will be advised to seek other work than that of a compositor, where he will not be again subjected to the deleterious effects of injesting lead.

Case No. 42.

S. P. age 75. Ward K. Admitted 6/3/16.

Diagnosis:- Contractures.

Feet in a position of extreme Talipes Equina-Cavus.

This is probably caused by an old paralysis not corrected and neglected for a long time. Severe contracture of each Tendo-Achillis and flexors of the feet. There are persistent tremors of the extremities.

30/3/16. Operation- Left Tendo-Achillis wrenched from the Os Calcis. A tenotomy of the Tendo-Achillis on the right side. Feet put up in a partially corrected position and plaster bandages applied.

6/4/16. Patient comfortable and encouraged to get up.

13/4/16. Complains of pain in her legs. This patient will not help herself at all.

29/4/16. Plasters removed. Feet wrenched under an anaesthetic. The positions are much improved and feet

again placed in plaster bandages.

4/5/16. Feet in a satisfactory position, but patient will crawl along the floor and spoil the splints. She makes no effort to help herself.

30/8/16. The feet are in good position but the patient is still very unenterprising. The treatment is being continued.

Case No. 43.

A. L. age 25. Ward X2. Admitted 1/10/08.

Diagnosis:- Friedreich's Ataxia.

Both legs completely paralysed. Drop foot on both sides with Pes Cavus. Tendo-Achillis contracted on both sides. Complete paralysis of the extensors of the wrists and fingers with drop wrist. Absence of elbow and wrist jerks. Flexors of the wrists and fingers are little affected and his grip is powerful.

It is thought that no treatment in this case will do any good.

Case No. 44.

W. P. age 64. Ward A1. Admitted 20/10/15.

Diagnosis:- S pinal Caries.

Patella reflexes exaggerated. Ankle clonus present.

Disturbances of sensation in both lower limbs. Doubly incontinent. Kyphosis of the spine in the lower dorsal region and Lordosis in the lumbar region. Legs spastic.

17/6/16. Left arm contracted at the elbow. Small muscles of the left hand wasted. Loss of motor power in the left hand and arm. Hips adducted. Knee jerks increased.

Right Tendo-Achillis contracted. Right big toe flexed and tendon contracted.

30/8/16. There is no improvement in this patient's condition. Treatment is being directed to the spine, and if he makes any progress, attention will be paid to dividing contracted tendons and he will be put on massage and movement, and with the help of splints some improvement may be looked for as regards his contractures.

Case No. 45.

J. K. age 69. Ward. XI. Admitted. 20-10-16.

Diagnosis:- Amyotrophic Lateral Sclerosis.

History of bronchitis for fourteen years and flexion of the knees for four years.

Inco-ordination of arms. Thenar eminence on each side wasted. The first Interosseus muscle on each side slightly wasted. The right Pectoralis Major contracted. Right Deltoid slightly contracted. Right Latissimus Dorsi weak. Extensors of fore-arm very weak. Great limitation of movement at right shoulder joint. Fibrillary twitchings well marked in both arms. No interference with sensation.

Legs.- Very spastic with contracted knee joints which are greatly flexed. Great limitation of movement at the knees. Left plantar reflex extensor. In the left leg the thermal sense is gone in all areas between the knee and ankle. A small patch of loss of thermal sense on the inner side of the right calf. Pain and tactile sense not altered. Marked muscular twitchings in the thighs and legs. Great wasting of the extensors of the thighs.

This patient was treated by means of extension by means of a stirrup of lead plaster with weight and pulley over the end of the bed. He was put on massage and passive movement and now his legs are quite straight and he is up and about all day. He cannot walk without some means of support but walks along the ward holding on to the ends of the beds.

Case No. 46.

E. M. D. age 45. Ward R. Admitted 31/7/14.

Diagnosis:- Spastic Paraplegia.

History of inability to move the limbs twenty-six weeks before admission.

Legs well nourished. Each Tendo-Achillis slightly contracted. Tibialis ~~and~~ Anticus also contracted. Knee jerks increased.

19/8/15. Patient falls about on trying to walk.

22/8/15. Spastic gait. Legs very rigid. Knee jerks increased. Plantar reflexes extensor. Abdominal muscles rigid. No nystagmus and no wasting of muscles.

3/9/15. Severe pains in the legs and lower part of abdomen. Extreme contractures of the legs, the heels touching the buttocks and there is severe adductor spasm. Abdominal muscles rigid as a board.

17/9/15. Extension applied by means of a stirrup of lead plaster with weight and pulley over the end of the bed.

28/9/15. The legs are now straight when the extension is on.

15/10/15. The extension is now arranged so that she can get up. An extension put on on returning to bed. There is wasting now of the small muscles of the hands.

11/1/16. In spite of the extension applied to both legs the patient is getting a backward dislocation of both knees. She has great pain in the legs which nothing seems to relieve.

25/4/16. For two months now patient has been in Croft's splints but the spasm of the legs break them shortly

after they are put on and she has pressure sores in the region of the knee.

27/4/16. Splints removed.

9/5/16. There is now more deformity of the legs. Severe backward dislocation of both knees with severe adduction of the thighs. There is limitation of movement in all directions at both ankles. Each Tibialis Anticus contracted and also contraction of the left Tendo-Achillis. Neither extensions with lead plaster nor by keeping the limbs straight with ordinary plaster nor by vigorous application of massage has any benefit resulted and the patient is in a much worse condition as regards contractures than when she was admitted two years ago.

Case No. 47.

N. R. age 31. Ward. B1. Admitted 29/12/15.

Diagnosis:- Disseminated Sclerosis.

History of symptoms for seven years.

Well marked spastic paraplegia and a strong tendency to contracture of the legs. Lateral nystagmus.

5/6/15. This patient had already been in this Infirmary from the 26th May, 1915 to the 23rd December 1915, and the following notes are taken from his previous case-paper.

24/8/15. Under an anaesthetic alcohol injected into the Obturator nerves.

30/8/15. There has followed considerable improvement in the spasm.

16/9/15. Alcohol injected into both sciatic nerves.

23/9/15. There is again considerable improvement in the spasm.

6/11/15. The improvement obtained after the injection of alcohol has now disappeared and the contractures are in the same condition as they were before. Under an anaesthetic the legs straightened and put into plaster splints and patient allowed to get up.

7/12/15. Under an anaesthetic fresh plaster splints applied.

23/12/15. Patient allowed to go home for Christmas, the splints being left on.

1/1/16. The patient returned on the 29/12/15. The plaster removed from the left leg and a large sloughing sore exposed on the anterior aspect of the left knee. There is some secondary synovitis in this knee. Both plasters broken by the force of the contractions.

7/1/16. Patient not very fit. Now there is marked intention tremor and loss of taste. He is doubly incontinent.

22/1/16. Patient not looking well, complains of insomnia, anorexia and absence of taste. Sores doing very well. Extension by means of a stirrup made of lead plaster with weight and pulley applied to his legs.

2/2/16. Legs wasting. Extension has no effect on the contractures. Severe flexion at the knees and hips. Intention tremor very marked.

14/2/16. Patient takes his discharge. No improvement in his condition.

Case No. 48.

J. M. M. T. age 25. Ward. X3. Admitted 5/3/10.

Diagnosis:- Hemiplegia and contractures due to an
 intracranial region.

History. At ten years of age patient had a series of attacks of sickness and vomiting. At eleven years of age she fell down the stairs. Unconscious when picked up. The fall "fixed" every limb and patient could not walk for ten minutes. A few months later patient when knitting felt her arm and leg "draw up" and she was unable to move them. The arm has been useless ever since. There was some improvement in the leg. Complains of "sinking" attacks ever since which make her helpless for the time being. Patient's sight failed at twelve years of age and now she is completely blind.

On admission. The left arm paralysed with the flexors contracted. Paresis of the left leg. Blind in both eyes. Right internal strabismus. Right pupil slightly larger than the left. Optic atrophy in both eyes. Slight paresis on the lower part of the face on the right side. Coarse nystagmus present. Plantar reflex extensor on both sides. 1/10/10. Tendency to contracture in both legs which is being corrected by charcoal splinting.

9/5/12. Patient does not like getting up. Paralysis of the left side complete. Left leg spastic with marked paresis. Knee jerks increased. Ankle clonus on both sides. Facial paralysis cleared up.

9/6/14. Complete left hemiplegia with contractions of the arm and leg. Considerable mental instability.

11/4/16. Patient had a "vision" today and as a result is

determined to get up and walk.

12/4/16. Patient now getting up and being dressed. Walking with assistance round the ward. Left arm still paralysed but it is hoped to reduce the deformity. Both legs move well with slight drop foot. There is slight contraction of each Tendo-Achillis. Patient very cheerful and very exulted.

15/4/16. A Croft's splint applied to the left leg after being straightened under an anaesthetic. This keeps the foot at right angles to the leg. Croft's splint removed every day to allow of massage and movement. Encouraged to walk about with the help of a stick.

25/8/16. The leg is doing very well. The contracture is being over-come. She is walking with the help of a stick. So far no attempt has been made to straighten the arm but it is hoped, considering the improvement in the leg, that after a suitable treatment with splints and massage she will have a fairly useful arm.

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Case No. 49.

G. G. age 33. Ward Cl. admitted. 7/4/16.

Diagnosis:- Syphilitic Endarteritis.

Biceps jerks exaggerated. Knee jerks exaggerated. Knee and ankle clonus present. Left plantar reflex extensor. Left arm flexed and rigid. Motor power in left arm and left leg weak. Sometimes doubly incontinent. Paresis on the left side of the face. Left arm flexed at the elbow with limitation of movement. Wrist and fingers flexed with limitation of movement. The fore-arm is pronated.

History. Syphilis, primary and secondary five years ago. Four months ago, patient found he was losing the use of his limbs. This improved, but several times after he would lose the use of his limbs with intervals of recovery in between.

Patient died. At the post mortem there was an area of softening in the brain on the right side, including part of the elbow of the Internal Capsule and areas of the Lenticular Nucleus and Opticthalamus bordering on the Internal Capsule. One of the branches of the Middle Cerebral artery was thrombosed and there were patches of atheroma on the Middle Cerebral artery.

Sections from certain muscles:-

Left Biceps - Some muscle fibres enormously swollen and in the centre of many of the fibres there is a clear translucent area. At the periphery the fibres are granular. Much proliferation of nuclei in connection with the Sarcolemma. Fibrosis slight in between the muscle bundles. Some arteries thrombosed.

Left Flexor Profundus Digitorum:-

Muscle fibres wavy and very atrophied. Much massive fibrosis. Some muscle bundles represented only by a patch of fibrous tissue. Some muscle bundles have degenerated en masse with no Sarcolemma to be seen. Each muscle cell surrounded by fibrous tissue in places. This section looks like a massive necrosis of muscle bundles and an advanced stage of repair by fibrosis.

Case No. 50.

E. T. age 47. Ward X3. Admitted 3/2/16.

Diagnosis:- Pseudo-Bulbar Paralysis.

History. Stated to have had a "stroke" ten years ago since when patient has been fed by a tube and she has been unable to speak.

Knee jerks exaggerated. Plantar reflexes extensor. Right shoulder contracted. Right elbow flexed at an acute angle. Wrist and fingers flexed. Very little movement at these joints. Right leg extended and stiff. Tendo-Achillis on the right side slightly contracted. Patient has Aphasia.

Treatment ordered:-

Charcoal splinting applied to the posterior aspect of the right arm and hand. It is proposed to gradually straighten the flexed joints by beginning at the fingers and working upwards until the joints are all straightened. She is also put on massage and passive movement daily, with the application of radiant heat four times a week.

The contraction of the Tendo-Achillis on the right side is to be over-come by means of charcoal splinting applied along the back of the leg and sole of the foot. By gradually bending the foot piece until it is at right angles to the leg together with massage, movement and radiant heat it is hoped to get a useful leg.

1/7/16. Patient died today. Death was caused by Half a banana getting into the Larynx. The treatment of the arm and leg was very successful as she was walking about

96. all day with the help of a stick. The right arm was straight but the joints were still stiff and she could not use the arm.

Case No. 51.

E. S. age 48. Ward. I. 1. Admitted 2/6/16.

Diagnosis:- Cerebral Haemorrhage.

State on admission. Right shoulder, elbow, wrists and fingers show limitation of movement. Right shoulder adducted. Right elbow, wrist and fingers all flexed. Right plantar reflex extensor.

Heart - Sounds irregular, faint, ~~short~~, and sharp.

This haemorrhage occurred a year ago.

Treatment - Charcoal splinting applied to the arm and the flexions are to be gradually reduced by straightening the splinting by degrees, starting with the fingers and working up the arm until finally the elbow is fully extended. Massage, movement and radiant heat ordered.

2/9/16. There is some considerable improvement in the contractures. The wrist and fingers are now straight but still stiff. The elbow is not yet fully extended but there is much more movement in it than formerly. She cannot yet use her arm to any extent, the grasp being very weak.

Case No. 52.

E. G. age 68. Ward H2. Admitted 21/4/15.

Diagnosis:- Cerebral haemorrhage.

This patient was admitted from another Infirmary.

State on admission - Left shoulder - great limitation of movement. Pectorals latissimus dorsi and Teres Major contracted. Slight flexion and limitation of movement at the left elbow. Left wrist flexed with limitation of movement. Left thumb adducted.

Left hand - metacarpo-phalangeal and phalangeal joints flexed and fixed. Knees - Both knees slightly dislocated backwards, flexed with great limitation of movement. Feet and ankles - No limitation of movement and no contractures.

This patient is too feeble for any method of treatment as regards her contractures to be of any benefit.

Case No. 53.

S. K. Age 78. Ward 2. 2. Admitted 11/4/16.

Diagnosis:- Cerebral haemorrhage.

Admitted with an old right sided Hemiplegia affecting the arm and leg. The knee is contracted but can be moderately straightened with difficulty. The arm is flexed at the elbow and there is limitation of movement. The wrist and fingers are flexed with limitation of movement.

Treatment - Patient to get up every day. Massage, movement and radiant heat ordered. Charcoal splinting applied to the arm, being bent so as to fit on to the posterior aspect of the arm, forearm, and hand.

The fingers to be straightened first, beginning with the distal phalanges and finishing at the elbow.

23/5/16. Patient had another haemorrhage today and died this afternoon.

The treatment has not been in existence long enough for any appreciable benefit to have taken place in her condition.

Case No. 54.

E. N. age 78. Ward. O. Admitted 24/5/16.

Diagnosis:- Cerebral haemorrhage.

Patient had a "stroke" two years ago.

Biceps, Triceps and Supinator jerks on each side increased. Left knee jerk exaggerated. Doubly incontinent. Both elbows flexed and contracted. There is wasting of the small muscles in both hands. Motor power in both hands weak. Left sided paralysis of the face.

This patient is too old and feeble for her to derive any benefit from the treatment of her contractures.

Case No. 55.

J. S. age 83. Ward C1. Admitted 26/10/15.

Diagnosis:² Cerebral haemorrhage.

History. Patient had a "shock" nine months ago. Has been incontinent ever since.

State on admission. Both sides knee jerks exaggerated. Ankle clonus present on both sides. Left knee flexed with some limitation of movement. Left Tendo-Achillis contracted. Left arm weaker than the right. Slight wasting in the small muscles of the left hand.

Eyes - Right pupil more dilated than left. Paresis of the Levator Palpebrae Superioris of the right eye. Doubly incontinent.

14/5/16. Right upper eye lid recovered. The motor power of the left arm is increased. Incontinent at times only. Since admission he has been treated regularly by massage and radiant heat. It was not thought necessary to apply splints to reduce the contractures. The contractures at the elbow, knee and foot have improved and he is up

and about all day. He walks very well with the help of a stick. The grasp of the left hand is quite good.

Left Tendo-Achillis is still slightly contracted.

20/6/16. Patient has just had another haemorrhage and is now confined to his bed.

25/8/16. Since his last haemorrhage this patient has been too feeble to derive any benefit from ~~the~~ treatment of his contractures. His left arm and leg are completely paralysed.

Case No. 56.

C. C. age 66. Ward X3. Admitted 1/4/16.

Diagnosis:- Cerebral haemorrhage.

History - Patient had a "seizure" on March 20th, last, losing power in the left arm and leg.

State on admission - Shoulder adducted and contracted.

Elbow, wrist and fingers flexed with limitation of movement. Leg extended with limitation of movement at the knee. Tendo-Achillis contracted. These contractures are on the left side.

Treatment - Ordered massage, movement and radiant heat. Charcoal splinting applied to the posterior aspect of the arm, fore-arm and hand to fit the various flexions of the joints. It is hoped to over-come the contractures by gradually straightening the joints beginning at the distal phalanges. The contraction of the Tendo-Achillis to be over-come by gradually approaching to a right angle the charcoal splinting applied to the back of the leg and the sole of the foot.

12/5/16. Contractures slightly improved, but patient makes absolutely no effort to help herself. It is

necessary to divide the Tendo-Achillis.

14/5/16. The Tendo-Achillis on the left side tenotomised.

21/5/16. Patient made to get up daily and attempt to walk, supported by a nurse. Massage, radiant heat and passive movements applied to the left, upper and lower limbs. The splints are taken off for the various manipulations and re-applied when nothing is being done.

29/8/16. The patient is now up and about all day and has quite a useful leg. She walks about freely without any support. The contractures have been over-come, but there is still some stiffness in the joints of the upper limb.

Case No. 57.

B. S. age 52. Ward M. Admitted 23/2/16.

Diagnosis:- Cerebral haemorrhage.

History of a "stroke" four years ago.

State on admission - Left arm flexed and rigid.

Left shoulder adducted and rigid. Left leg straight with great limitation of movement at the knee.

Paresis of the left side of the face. Left wrist and fingers flexed with limitation of movement. Left

Extensor Longus Hallucis Tendon contracted. Extensor

Plantar reflex on the left side. Left Tendo-Achillis

contracted. The treatment ordered in this case

was charcoal splinting applied to the left upper limb

with gradual extension of the joints starting at the

distal phalanges. The left Tendo-Achillis to be

tenotomised. Massage, manipulations and radiant heat

101. ordered. This patient died shortly after admission.

Case No. 58.

A. E. age 64. Ward I.2. Admitted 16/6/15.

Diagnosis:- Cerebral Haemorrhage.

History - Patient fell down in the street two days ago.

State on admission - Doubly incontinent. Right arm and leg flaccid. On the right side knee jerk diminished, Plantar reflex extensor. Motor aphasia.

2/5/16. Speech now almost recovered but there is slight slurring. Right leg recovered in power. Right arm flexed at elbow, wrist and fingers flexed and forearm pronated. There is limitation of movement at all these joints. Charcoal splinting applied to the posterior aspect of the upper limb and bent so as to fit on to the flexions. The splint will be gradually straightened, beginning at the distal phalanges. Massage, manipulations and radiant heat ordered.

15/8/16. Patient up and about all day. Right knee still stiff and she walks with the help of a stick. Right elbow, wrist and fingers nearly straight. The splint has been discarded for the last month, but she is still having massage, movements and radiant heat. She has no power in the right arm. The muscles of the fore-arm and upper arm both extensors and flexors, are as hard as a board, which points to a condition allied to Volkmann's Ischaemic Contracture.

Case No. 59.

E. H. age 50. Ward O. Admitted 21/12/10.

Diagnosis:- Cerebral Haemorrhage.

On admission there was loss of power in the right arm

and right leg. Patient had slurring speech and she was doubly incontinent.

23/4/16. Speech slurring. Right upper limb flexed at elbow, wrist and fingers with limitation of movement. Fore-arm pronated. This arm is rigid and paralysed. Right leg slightly rigid but she has more power in it than in the arm. She cannot get about without assistance. She is not now incontinent. The muscles of the right fore-arm and arm both flexors and extensors are so hard that they cannot be dented with the fingers, which points to a condition allied to Volkmann's Ischaemic Contracture. Charcoal splinting applied to the posterior aspect of the right upper limb and bent so as to fit the flexions. The various joints to be gradually extended starting at the terminal phalanges and finishing at the elbow. Massage, manipulations and radiant heat to be applied.

1/9/16. Patient a big heavy woman who required help in moving about. There is not much improvement in the power of her leg. The arm is now straightened, but the joints are very stiff and she has no power in it.

Case No. 60.

E. S. age 63. Ward O. Admitted 21/10/15.

Diagnosis:- Cerebral Haemorrhage.

20/12/15. Patient was admitted five ~~months~~ after having had a "stroke"

Internal strabismus left eye. Left upper limb flexed at elbow, wrist and fingers with great limitation of movement at these joints. Left knee flexed with

limitation of movement. Left foot plantar flexed with contraction of the Tendo-Achillis. Left leg and arm put on charcoal splinting applied to the posterior aspect of these limbs and it is hoped to gradually over-come the flexions by gradually dorsi-flexing the splinting. Massage, manipulations and radiant heat ordered.

12/2/16. This patient is not doing well. She has become mental and always pulls off the splints. Extension by means of a stirrup of lead plaster with weight and pulley over the end of the bed was also tried, but she pulled that off.

4/7/16. There has been no success with this patient. Her general condition has gone from bad to worse and a week ago she had another Cerebral Haemorrhage.

5/7/16. Patient died today.

Some sections of muscles were obtained Post-Mortem-
Left Semitendinosus- Thrombosed artery. Muscles fibres small and shrunken leaving clear spaces between them.

This might be some oedema which disappears on cutting.
Slight fibrosis. Sarcolemma- nothing to note.

Left Musculo-Culaneus nerve- Some fibrosis between individual nerve fibres.

Left Sciatic nerve- Some fibrosis between individual nerve fibres.

Right Biceps Cruris- The whole muscle at various stages of atrophy. The proliferation of the nuclei in connection with the sarcolemma is most intense and universal.

Massive sclerosis in places. All the coats of the vessel walls thickened. ~~Left=B~~

Left Biceps Cruris- All muscle fibres atrophied. The proliferation of the nuclei in connection with the sarcolemma is most intense and universal. Massive sclerosis in places. All coats of the vessels thickened.

Right Biceps of the arm- No fibrosis. Slight proliferation of the nuclei in connection with the sarcolemma. The transverse striation is well marked.

Left Biceps of the arm- Change is not very marked. A medium amount of fibrosis around the muscle bundles and vessels. Middle and outer coats of the vessel wall thickened.

The right semitendinosus- Fibrosis between the muscle bundles and between individual fibres. No proliferation of the nuclei in connection with the sarcolemma.

Case No. 61.

M. J. H. age 64. Ward G2. Admitted 9/7/15.

Diagnosis:- Cerebral Haemorrhage.

History. Patient had a left sided paralysis six years ago and had another "stroke" three years ago.

15/2/16. Left shoulder adducted and fixed with contracted muscles. Left elbow flexed at a right angle with great limitation of movement. Wrist flexed and fixed. At Metacarpo-phalangeal and phalangeal joints there is extreme extension.

Left knee slightly flexed and fixed. Left foot in a position of Talipes Equinovarus with the Tendo-Achillis contracted and great limitation of movement.

Left Extensor Longus Hallucis tendon contracted and great toe dorsi-flexed. Both hip joints practically

fixed. Right knee almost straight with great limitation of movement.

23/3/16. The left Tendo-Achillis tenotomised under an anaesthetic and the foot placed at right angles to the leg and kept in position by means of charcoal splinting applied to the posterior aspect of the leg and sole of the foot. At the same time the hip joints were moved freely. Charcoal splinting applied to the left upper limb and bent so as to fit the flexions at the elbow and wrist and the extensions of the fingers. It is hoped first of all to flex the fingers by flexing the splint and then to extend the wrist and elbow. Massage, manipulations and radiant heat to be applied.

2/8/16. Patient much improved. Up and about, and walking supported by a nurse. Movement at the hips and knees fairly free. Movement at left ankle quite free. The arm has not done so well as the legs.

The arm splinting is applied on alternate weeks and massage with radiant heat is being persisted in. The fingers can now be flexed and the wrist and elbow extended, but these joints are still very stiff.

Case No. 62.

M.F. age 63. Ward G2. Admitted 28/9/15.

Diagnosis:- Cerebral Haemorrhage.

20/1/16. Right wrist and fingers somewhat flexed and stiff. Right knee flexed with limitation of movement. Right Tendo-Achillis is contracted.

Treatment- Charcoal splinting applied to the right arm

and leg. It is hoped that by gradually bending the foot piece to approach a right angle and gradually extending the joints of the upper arm beginning at the fingers, that the contractures will be over-come.

Massage, manipulations and radiant heat brdered.

27/7/16. Patient up and about all day. Walks quite well without any support. Although the joints of the arms have been straightened there is no power in that limb.

Case No. 63.

S. J. age 65. Ward A2. Admitted 11/4/16.

Diagnosis:- Cerebral Haemorrhage.

State on admission- Doubly incontinent. Right shoulder adducted, contracted with limitation of movement. Right elbow, wrist and fingers flexed with limitatbon of movement. Right thumb adducted with limitation of movement. Paresis of the right side of the face. Right knee flexed and stiff. Right ankle stiff. Tendo-Achillis contracted.

Treatment - Charcoal splinting applied to arm and leg. By straightening the splints, the contractures to be gradually over-come. Massage, manipulations and radiant heat to be applied.

7/9/16. This patient has improved. The upper arm joints are straight. The right foot is at right angles to the leg, the joints however are stiff and he has not made a great deal of progress.

Case No. 64.

G. F. age 75. Ward A2. Admitted 31/3/16.

Diagnosis:- Cerebral Haemorrhage.

State on admission- Right shoulder adducted contracted. Right elbow, wrist and fingers flexed with limitation of movement. Right hip and knee greatly flexed with limitation of movement. Right plantar reflex extensor. Doubly incontinent.

28/7/16. This case was treated in the usual way with massage, manipulations and radiant heat. Charcoal splinting to the right upper arm. The right leg put on extension by means of a stirrup of lead plaster with weight and pulley over the end of the bed. He did not make any progress, having another haemorrhage and dying on the 27/7/16.

Case No. 65.

A. B. C. age 52. Ward Z1. Admitted 28/4/16.

Diagnosis:- Cerebral Haemorrhage.

State on admission.= Paralysis of left arm and left leg. Paresis of the left side of the face. Left knee jerks exaggerated. Left plantar reflex extensor.

15/6/16. Hand and foot showing a tendency to drop wrist and drop foot so charcoal splinting applied to keep the hand and foot dorsiflexed in an over corrected position. Massage, manipulation and radiant heat ordered.

20/8/16. Arm and foot recovered a certain amount of power. Splints dispensed with, massage and radiant heat being continued. Patient up and about all day and doing very well. He is somewhat ataxic.

Case No. 66.

J. E. F. age 55. Ward C1. Admitted 7/4/16.

Diagnosis:- Syphilitic Endarteritis.

History - Paralyzed for two years. This gradually affected his left leg and spread to his left arm.

State on admission:- Speech slurred. Left elbow, wrist and fingers flexed and rigid. Left fore-arm pronated. Left interosseal muscles wasted. Biceps, Triceps and Supinator jerks on the left side exaggerated. Left leg somewhat rigid and stiff.

Treatment- Galyol injected intravenously to be followed by the injection intramuscularly of a grain of mercury per week for six weeks. Massage, manipulations and radiant heat to be applied to the left upper limb.

Charcoal splinting applied to the left arm.

1/9/16. This patient has not done well. He is up and about all day. The arm has been straightened gradually by means of the splinting but the joints are stiff and he has no power in his wrist or fingers.

He is a patient who does nothing to help himself.

Case No. 67.

J. S. age 76. Ward 21. Admitted 16/5/16.

Diagnosis:- Senile Paraplegia.

A very feeble old man. Dirty in his habits. Doubly incontinent. Motor Aphasia. Legs, arms, abdomen, back and neck rigid. Shoulders adducted. Elbows flexed. Wrists straight and slightly rigid. Thighs flexed and adducted. Knees flexed and rigid. Slight rigidity at the ankles.

This is evidently the muscular form of Senile Paraplegia described in Allbutt & Rolleston, volume 7, page 805.

Treatment- This patient is to get up all day. He is to have gentle massage and passive movements together with occasional hot baths.

2/9/16. This patient died about a week ago.

Case No. 68.

J. L. age 64. Ward C1. Admitted 14~~2~~3/3/16.

History. Patient has very gradually lost the use of his limbs during the last ten years. Arms flexed at the elbows. Very little range of movement at the shoulders and elbows. Shoulders very contracted. Knees straight and stiff with limitation of movement. Limitation of movement at the hips. Mask-like face. The tremor and head-nodding is not a prominent sign in this case.

This patient ordered to get up and about all day.

10/8/16. There is no change in this patient's condition. He is encouraged to move about the ward as much as possible with the help of some of the convalescent patients.

Case No. 69.

F. R. age 55. Ward A2. Admitted 19/4/16.

Diagnosis:- Paralysis Agitans.

State on admission- Shoulders adducted with limitation of movement. Elbows slightly flexed with limitation of movement. Wrists straight and somewhat stiff. Ulnar deviation of the fingers with slight limitation of movement. Hips straight and stiff. Knees slightly flexed with some limitation of movement. Each Tendo-Achillis contracted with some limitation of movement at the ankles.

This patient ordered up all day and encouraged to move about as much as possible. Put on gentle massage and passive movements. The tremor is most noticeable in his upper limbs. Slight head nodding at times.

6/9/16. Patient going on very well. His joints are not nearly so stiff as they were and he can walk by himself with the support of a stick.

Case No. 70.

S. G. age 60. Ward O. Admitted 21/4/15.

Diagnosis:- Paralysis Agitans.

History.- In bed for four years at another Infirmary. Since admission she has been ordered up six days in the week.

24/4/16. Patient has head nodding, tremor of hands, (making of bread pills) tremor of lower jaw, Some rigidity of the back. Some flexion at the elbows with limitation of movement. Hips stiff but can be moved in all directions. No flexion at knees, but stiff. Ankles- Each Tendo-Achillis much contracted.

Considerable limitation of movement at the ankle joints.
Tremor and head nodding very severe in this case so
patient put on-

R.

Hyoscinae Hydrobrom. gr. one third.

Phenazoni Drachm $\frac{11}{16}$.

Aquae Chlorof. ad Ozs 20. Misce.

Ft. mistura. Cpt. Ozs $\frac{1}{2}$. ter

in die post cib.

(Whitla's Dictionary of Treatment, page 723.)

2/9/16. Patient going on very well. The above prescription certainly relieved her tremor to a great extent. The joints are not so stiff. Patient for the last month has been on gentle massage and passive movements. It is hoped that by persevering in the above methods of treatment the patient will be able to get about by herself.

Case No. 71.

J. T. P. age 49. Ward B2. Admitted 3/5/16.

Diagnosis:- Neglected Infective Arthritis.

Severe flexion of the right arm at the elbow. Right wrist and fingers flexed and rigid. Left elbow, wrist and fingers slightly flexed with some limitation of movement. Both knees show severe flexion with practically no movement. Both ankles very stiff with contraction of each Tendo-Achillis and of the tendons on the dorsum of the foot. Slight backward displacement of the tibia on the femur.

Treatment- Attention first to be paid to the legs.

Extension applied by means of a stirrup of lead plaster with weight and pulley over the end of the bed. Massage, manipulations and radiant heat to be applied to the arms.

10/7/16. The extension has not been successful in reducing the flexion at the knees. The upper limbs do not show much improvement.

5/8/16. Patient given a general anaesthetic and all his joints moved as much as possible. They were very stiff and it took some considerable force to get a reasonable amount of movement. The various joints were straightened to a great extent.

6/8/16. Patient appears to have a slight attack of delayed chloroform poisoning.

12/8/16. Patient recovered from the attack. Legs put on extension by means of a stirrup of lead plaster. Charcoal splinting applied to the posterior aspect of both arms. Massage, manipulations and radiant heat ordered for the arms. Manipulations only, ordered for his lower limbs.

30/8/16. Patient doing very well. Considerable movement obtained in all his stiff joints. Arms and legs much straighter than they were. The charcoal splinting on the arms being gradually bent straighter every day and therefore the flexion is being gradually reduced.

Case No. 72.

L. H. Aged 45. Ward O. Admitted 15/10/15.

Diagnosis:- Neglected Infective Arthritis.

History- Patient has been in bed for twenty years at another Infirmary. She was put there when she first had pain and swelling of the various joints and has been kept there ever since.

State on admission- This patient under X Rays shows bony ankyloses of nearly every joint in her limbs.

Shoulder joints adducted and fixed. Elbow, wrist and finger joints flexed and fixed except the Metacarpophalangeal joints which are extended and fixed. Hip joints straight and fixed. Knees straight and fixed. Ankles fixed in a position of Talipes Equinus with Each Tendo-Achillis contracted. The right foot is twisted outwards at the tarsal joints so that the toes point outwards.

Evidently no treatment will be of any avail in this case.

Case No. 73.

A. P. age 49. Ward I.2. Admitted 24/9/12.

Diagnosis:- Periarticular Arthritis.

Practically all the joints of the limbs involved. There is every-where periarticular swelling, the joints being shapelessly enlarged. Knees contracted and feet oedematous.

24/8/16. All the joints of the limbs and part of her vertebrae affected. Elbows flexed. Elbow and wrist joints shapelessly enlarged with severe limitation of movement. Hip and knees flexed and stiff. Foot plantar flexed with limitation of movement in all directions. Knee and ankle joints shapelessly enlarged. X Rays show slight osteophytic changes.

This patient will do absolutely nothing for herself. Lies in bed all day and refuses to get up. Massage, manipulations and radiant heat have been tried many times over considerable periods, but the peculiar mentality of many of these cases absolutely prevents good results being obtained.

Case No. 74.

A. B. age 73. Ward X3. Admitted 23/10/07.

Diagnosis:- Arthritis of unknown origin.

23/10/07. Contractures of both legs and deformities of both ankles. Left wrist shows arthritic changes.

Bed-ridden through neglect.

28/8/16. All the joints of the limbs show arthritic changes. Shoulders adducted, elbows flexed, wrists straight, all with severe limitation of movement.

Fingers showing varying degrees of deformity with limitation of movement. Hips flexed and stiff. Knees flexed, severe limitation of movement with partial dislocation of the tibia laterally on the femurs.

Ankles fixed in position of Talipes Equino-Varus.

XRays show some slight ankyloses in the wrists and ankles; with some rarefaction at the ends of the phalanges and some osteophytic out-growths at some of the interphalangeal joints.

This patient has consistently refused to get up or do anything for herself. There is some mental condition present which allows her to be perfectly satisfied as long as she is left alone and not asked to do anything for herself. Every effort has been made extending over long periods, sometimes as long as a year at a time, but no benefit results because she always resists anything done for her benefit.

Case No. 75.

S. K. age 64. Ward X3. Admitted 7/9/98.

Diagnosis:- Periarticular Arthritis of unknown origin. Admitted with a sore throat and pains in her joints. Patient has delusions. By 1908 patient had well advanced arthritic changes in all the joints of her limbs. She has always been bad tempered and objectionable but never sufficiently insane to be certified. She has never done anything to help herself, but simply lies in bed and refuses to move. Many attempts have been made over prolonged periods since she was admitted, by means of radiant heat, massage and manipulations and various forms of extension to enable her to get up and about, but she absolutely refuses to be treated in any way and there was always trouble which took up a great deal of the nurses time when anything was being done for her. For this patient to get the full benefit of treatment it would require two nurses to give their whole time over a prolonged period for any good results to be obtained, but even that, considering the mentality of the patient might lead to no very appreciable benefit.

At present patients joints in all her limbs show contractures and all show limitation of movement. The shoulders are adducted, the elbows flexed, the hips and knees flexed, feet in a position of Talipes Equinus and the fingers and toes show varying degrees of contracture with limitation of movement. X-rays show very little bony change, but various joints appear to

have slight osteophytic changes. None of the joints are ankylosed. The knees show some backward displacement of the Tibia.

Case No. 76.

E. G. age 54. Ward I.2. Admitted 22/8/16.

Diagnosis:- Periarticular Arthritis.

Symptoms started with pain and swelling in the hands and fingers some months ago. Since then she has had pain and swelling in various joints at various times.

Constipation for years. Carious teeth for years.

Arterial walls thickened. The shoulders are freely movable but there is creaking present.

Elbows- flexed, tender and painful and shapelessly enlarged. Wrists- slightly flexed, tender and painful with limitation of movement. In the Carpo-metacarpal joints there is severe limitation of movement. On both sides there is slight ulnar deviation of the fingers. There is wasting in the small muscles of both hands. At the hip joints there is slight limitation of movement.

Knees- Creaking felt, flexed, tender, painful with limitation of movement, also shapelessly enlarged.

There is wasting of muscles both above and below the knees. Ankles- painful and tender with limitation of movement. There is slight oedema of the legs. Hallux Valgus both toes. Severe Pyorrhoea present.

14/8/16. Under gas all her teeth extracted.

24/8/16. Mouth now quite clean. Patient ordered radiant heat, massage and manipulations. To get up and about all day.

2/9/16. Patient very much improved. Tenderness and swelling of the joints has disappeared. There is still some stiffness present, but it is hoped that in another month or so, she will be able to be discharged to take up the ordinary duties of life again.

Case No. 77.

J. T. age 33. Ward H3. Admitted. 35/3/11.

Diagnosis:- Periarticular Arthritis.

Elbows, wrists, knees and ankles swollen, slightly tender, somewhat painful and stiff.

21/8/16. Patient is very deaf and has chronic Otorrhoea.

Shoulders adducted, elbows flexed, wrists slightly flexed, fingers in varying degrees of deformity.

There is limitation of movement in all these joints.

Hips straight and stiff. Knees slightly flexed with

limitation of movement. Ankles in a position of

Talipes Equinus with each Tendo-Achillis contracted.

Back somewhat rigid. X Rays show no bony change in any of her joints. Since admission repeated attempts have been made with massage, manipulations and radiant heat,

to get this patient in such a condition, so that she could do something for herself. ~~She~~ Another attempt

is being made at present and she has been under

vigorous treatment for two months. There is less

limitation of movement in her various joints, but

there is some mental condition which prevents this

patient from helping herself. She refuses to move

hand or foot unless compelled to do so by some-one

standing over her and compelling her to do what she is

told. It is feared that good results will not be obtained here.

Case No. 78.

G. R. B. age 14. Ward Ds. Admitted 31/7/16.

Diagnosis:- Imbecile. Contractures.

Shoulders adducted with limitation of movement. Elbows flexed and stiff. Wrists- extreme flexion and very stiff. Left Club Foot.

This bdy is only here for a few days and is being sent to an Imbecile Home.

Case No. 79.

M. B. age 52. Ward I.2. Admitted 26/2/16.

Diagnosis:- Periarticular Arthritis. Pyorrhoea.

History- A healthy woman up to six years ago when suddenly taken with "rheumatic" pains in all her limbs with sore throat which lasted four or five weeks, during which period she stayed in bed. Two years ago she had a similar attack which was not nearly so severe and she only had to stay in bed two weeks.

State on admission- Constipated. Severe pyorrhoea Alveolaris. Right and left elbows shapelessly enlarged, tender, painful with limitation of movement. Left wrist= painful, tender with limitation of movement. Right interphalangeal joints show slight enlargement. Knees shapelessly enlarged, tender, painful. Both ankles swollen, tender and painful. Right big toe swollen, red, tender and painful. Left Trapezium and both Sterno-mastoids painful and tender.

10/4/16. All teeth extracted under a general anaesthetic.

20/4/16. Mouth now quite clean. There is very little

tenderness in any of her joints so she is put on massage, manipulations and radiant heat and encouraged to move about the ward as much as possible.

3/6/16. There is much improvement in her condition. The joints are still slightly stiff with some pain in them at times.

14/7/16. Patient is up and about all day. There is now no pain and no tenderness. To be discharged tomorrow.

2/9/16. Patient came up to report herself several days ago. She has had no further trouble and has been able to follow her work as a charwoman regularly since she was discharged.

Case No. 80.

A. B. age 80. Ward A2. Admitted 21/10/15.

Diagnosis:- Chronic Arthritis.

A history of seven years. The trouble started in the hips, then spread to the knees and then to the hands and ankles.

State on admission- Hips flexed with severe limitation of movement. Knees flexed so that the heels almost touch the buttocks. Each Tendo-Achillis contracted. Feet in a position of Talipes Equino-Varus.

Patient has chronic Bronchitis. Arteries- Walls greatly thickened.

1/6/16. This patient is too old and feeble for any attempt to be made to reduce his contractures. They have been so long neglected that it probably would take many months to make any improvement at all in his condition, and he is not in a fit condition to attempt

any vigorous methods of treatment.

17/6/16. Patient died today.

Sections obtained Post-Mortem.

Left Adductor Brevis- Slight fibrosis. A few swollen muscle fibres scattered through the section. Nuclei in connection with the Sarcolemma very actively proliferating. Atrophy of muscle not marked. ~~R~~

Right Adductor Brevis- A slight amount of fibrosis. Diffusely swollen muscle fibres scattered here and there. Whole appearance like the last section.

Left Quadriceps- Changes much the same as in the above sections. Enormous proliferation of the Nuclei in connection with the Sarcolemma. No transverse striation in the swollen fibres.

Right Quadriceps- Fibrous tissue forming around the muscle fibres. Some proliferation of the Nuclei in connection with the Sarcolemma. ~~R~~

Right Biceps Cruris- Fibres very atrophied. No fibrosis. In some places there are early stages of atrophy of the muscle with proliferation of the Nuclei in connection with the Sarcolemma.

Left Biceps Cruris- Vessels show greatly thickened walls. There is a massive fibrosis around the vessels. Fibres very atrophied. The middle and outer coats of the arteries are greatly thickened but there is no change in the inner coat.

Left Semitendinosus- Fibrosis between the muscle bundles but not between individual fibres. Vessel walls not thickened.

Right Semitendinosus- Fibrosis well marked around the muscle fibres. There is still some transverse muscle triation. Some muscle fibres greatly swollen.